Griffy Lake
Aquatic Vegetation Management Plan
2008 Update-Draft

Monroe County, Indiana

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Prepared for:

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Executive Summary

This report was created in order to update the Griffy Lake Aquatic Vegetation Management Plan. The original Griffy Lake AVMP was completed in 2005 in response to the discovery of Brazilian elodea (*Egeria densa*). The primary objective of the original plan was the eradication of Brazilian elodea (Aquatic Control 2005). This was the first public access lake in Indiana to contain this invasive species, so eradication of was a priority. Surveys completed in 2004 found Brazilian elodea at 32.3% of sample sites. The invasive species Eurasian watermilfoil (*Myriophyllum spicatum*) and curlyleaf pondweed (*Potamogeton crispus*) were also abundant. IDNR funded a whole lake fluridone treatment in 2006 as part of the original plan's recommendations. The 2006 treatments significantly reduced Brazilian elodea abundance to the point that no rooted Brazilian elodea was observed at any point in the 2006 season. An additional whole lake fluridone treatment was planned for 2007. Prior to the treatment, IDNR conducted a Tier II survey and found Brazilian elodea present at 2.4% of the sites. Curlyleaf pondweed was the only other exotic species collected and it was discovered at 23.5% of sites. Treatment was initiated on May 1, 2007. Concentrations of fluridone above 5.0 ppb were maintained in the lake throughout the 2007 growing season. A Tier II survey consisting of 100 points was completed on August 21, 2007 and no Brazilian elodea was detected.

Vegetation management efforts in 2008 focused on detection of any remaining Brazilian elodea. Tier II surveys were completed on three different occasions; May 5th, July 8th, and August 28th. Brazilian elodea was not detected during any of the 2008 surveys and native vegetation increased in abundance and diversity when compared to 2007 data.

In addition to the Tier II surveys an invasive mapping survey was completed on April 9th in order to locate areas of curlyleaf pondweed and Eurasian watermilfoil that may have survived or returned following the whole lake treatments. No Eurasian watermilfoil was detected, but 15.7 acres of curlyeaf pondweed was mapped. Curlyleaf pondweed was treated on April 17 with 1.0 ppm of Aquathol K herbicide (active ingredient: endothal). Eurasian watermilfoil returned to the lake following the spring floods. A 2.95 acre area of milfoil became established in the very upper end of the lake and was treated with Renovate herbicide (active ingredient: triclopyr) on July 22nd. Both treatments effectively controlled the targeted invasive species.

It is recommended that this aggressive sampling approach should continue at least through 2009 in order to insure that Brazilian elodea eradication has been achieved. This sampling will also be valuable for its ability to detect additional areas of curlyleaf pondweed and Eurasian watermilfoil. If any Brazilian elodea is detected it should be immediately dealt with in order to prevent spread. If detected in rake sampling, a 5-acre area surrounding the detection site should be treated with 150 ppb of Sonar PR. This area should be sampled again 12 weeks after treatment with a minimum of 20 rake tosses along with a visual inspection. If needed, the estimated cost of this type of treatment is $30,000. It is highly unlikely, but if Brazilian elodea is detected during the spring sampling in multiple areas or in locations greater than 1-acre, then another whole lake treatment should be initiated immediately. Due to the importance placed on the eradication of Brazilian elodea, it is recommended that IDNR budget for these actions.

Eurasian watermilfoil and curlyleaf pondweed should also continue to be controlled in Griffy Lake. Tier II sampling will be adequate to detect any areas of Eurasian watermilfoil. If Eurasian watermilfoil is detected it will likely be present at very low levels much like it was in 2008. The areas should be quickly treated with Renovate herbicide.

Early season treatment of curlyleaf pondweed should be continued in 2009 with low doses of Aquathol K herbicide. Areas of curyleaf pondweed should be mapped prior to treatment. Treatment may be needed for up to three consecutive seasons in order to exhaust turion supplies. Approximately 17.0 acres of curlyleaf may require treatment in 2009. Curlyleaf pondweed and potential Eurasian watermilfoil treatments would require funding from the City of Bloomington Parks Department. It is recommended that the Parks Department apply for LARE grants for treatment on curyleaf pondweed and Eurasian watermilfoil.

As expected, whole lake fluridone treatments in 2006 and 2007 did reduce the abundance of native vegetation. However, these species appear to be returning and colonizing areas once dominated by the invasives. There will be no need for Park or IDNR personnel to revegetate Griffy Lake.

Acknowledgements

Funding for the vegetation sampling, treatment, and the plan update was provided by the Indiana Department of Natural Resources (IDNR) Division of Fish and Wildlife. Aquatic Control Inc. and IDNR completed the field work, data processing, and map generation. Special thanks are given to Doug Keller, Dave Kittaka, Angela Sturdevant, and Debbie King with the Indiana Department of Natural Resources for their assistance and review of this plan. Special thanks are also given to Angie Smith and Steve Cotter with Bloomington Parks and Recreation for their assistance with this plan. Author of this report is Nathan Long of Aquatic Control. The author would like to acknowledge the valuable input from Brendan Hastie, Tyler Zschiedrich, Joey Leach, and Barbie Huber of Aquatic Control for their field assistance, map generation, review, and editing of this report.

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1.0 INTRODUCTION

The original Griffy Lake Aquatic Vegetation Management Plan was created in 2005 following the discovery of Brazilian elodea in Griffy Lake (Aquatic Control 2005). This plan update is the third update of the original plan. The update was funded by the Indiana Department of Natural Resources and should serve as a tool to track changes in the vegetation community and make the necessary adjustments to the vegetation management action plan. Items covered include an updated problem statement, an update on the management history and goals, an update on water body uses, 2008 sampling results, plant sampling discussion, a review of the 2008 vegetation controls, a review of vegetation management control options, and updates to the budget and action plans. Once reviewed and approved, the update should be included in the original vegetation management plan, following the 2007 update and prior to the Appendix.

2.0 PROBLEM STATEMENT

Eurasian watermilfoil, Brazilian elodea, and curlyleaf pondweed are the primary nuisance submersed aquatic plant species in Griffy Lake (Figure 1). Curlyleaf pondweed and Eurasian watermilfoil are relatively prevalent throughout Indiana and have been present in Griffy Lake for at least twenty years. However, Brazilian elodea is very rare in Indiana. It was first identified in Griffy Lake in 2001, but no action was taken. Following a 2004 plant survey, completed by IDNR district fisheries biologist Dave Kittaka, it was agreed that action must be taken to prevent the further spread of this species. Brazilian elodea has been documented in only a few ponds in the southern half of the state. To our knowledge, Griffy Lake is the largest public body of water containing this exotic species in Indiana. Elimination of this species should be a primary aquatic plant management goal for the Indiana Department of Natural Resources and citizens concerned with the well being of Griffy Lake. If left unchecked, this species could spread to other lakes in Indiana where it may displace native vegetation and ruin fisheries due to its ability to form dense monoculture plant beds.

Figure 1. Illustrations of Brazilian elodea (left), Eurasian watermilfoil (center), and curlyleaf pondweed (right) (Illustrations provided by Applied Biochemist).

3.0 MANAGEMENT HISTORY AND GOALS

The primary goal of the original plan was the elimination of Brazilian elodea. This was the first public access lake in Indiana to contain this invasive species, so eradication of this species was a priority. Aquatic Control completed a survey in 2004 and found Brazilian elodea at 32.3% of sample sites. The invasive species Eurasian watermilfoil and curlyleaf pondweed were also found to be abundant in Griffy Lake. The Indiana Department of Natural Resources (IDNR) conducted a survey in 2005 that indicated that Brazilian elodea was continuing to spread throughout the lake. IDNR funded a whole

lake fluridone treatment in 2006 as part of the original plan's recommendations. The 2006 treatments significantly reduced Brazilian elodea abundance to the point that no rooted Brazilian elodea was observed at any point in the 2006 season. However, Brazilian elodea stems were collected during late summer rake sampling. Due to the presence of these stems, and the importance of eradicating this species, an additional whole lake treatment was planned for 2007. Prior to the treatment, IDNR conducted a Tier II survey and found Brazilian elodea present at 2.4% of the sites. Curlyleaf pondweed was the only other exotic species collected and it was discovered at 23.5% of sites. Treatment was initiated on May 1, 2007. Concentrations of fluridone above 5.0 ppb were maintained in the lake throughout the 2007 growing season. A Tier II survey consisting of 100 points was completed on August 21, 2007 and no Brazilian elodea was detected.

4.0 WATERSHED AND WATER BODY CHARACTERISTICS

Griffy Lake is a 109-acre reservoir located within the 1,180-acre Griffy Lake Nature Preserve in Monroe County. The lake lies approximately one mile north of Bloomington, Indiana. The maximum depth of Griffy Lake is 31 feet near the dam and the average depth is 10 feet. Griffy Lake was built in 1924 in order to provide additional water supply to the city of Bloomington. The dam was raised to its present height in 1943. The city of Bloomington no longer uses Griffy Lake as a water supply reservoir. Griffy Lake and a large part of the watershed is owned by the city of Bloomington and managed by Bloomington Parks and Recreation. Griffy Lake's drainage basin encompasses approximately 5,160 acres of land including the lake area (Figure 2) (JFNew 2008 & Jones et. al., 1984). The watershed is drained by Griffy Creek, which has three equally sized branches or forks. Presently, the North Fork watershed is fairly pristine, the Middle Fork is in the first stages of urbanization, and the South Fork is rapidly urbanizing (Commonwealth Biomonitoring, 2000). Public access, in the form of a boat ramp, is located in the southeast corner or upper end of the lake. This access site is managed by Bloomington Parks and Recreation. Boating is limited to electric motors only.

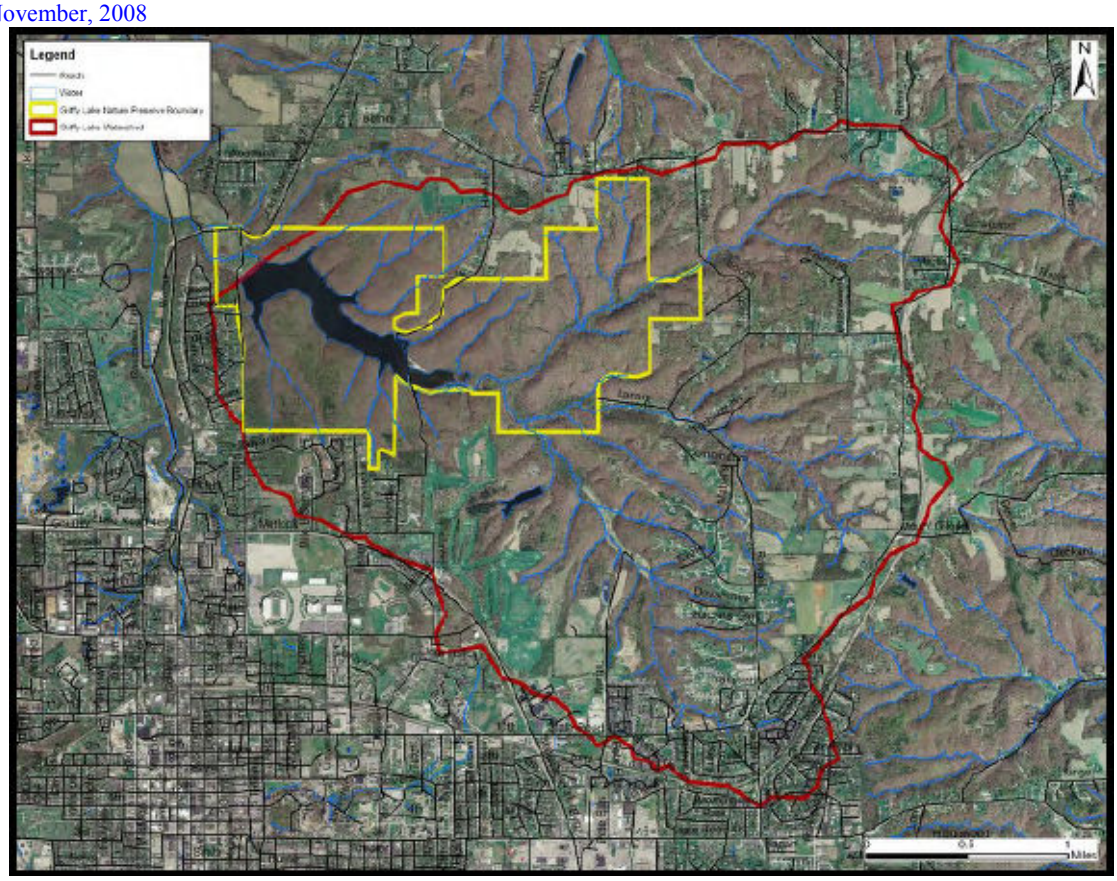

Figure 2. Griffy Lake watershed boundary (JFNew 2008).

Griffy Lake's water quality has been assessed regularly over the past 16 years. In 2008, JFNew completed a Master Plan for Management of the Griffy Lake Nature Preserve which includes a summary of recent water quality data. Most water quality data has been collected by the Indiana Clean Lakes Program, volunteer monitors, and Indiana University students as part of limnology class exercises. Data indicates that water quality in Griffy Lake has remained stable over the past 17 years. Water clarity in Griffy Lake rates as relatively good for the region, and is better than most lakes in Indiana. Since 1991, Secchi disk transparency has ranged from 4.0 feet in April 2006 to 23.0 feet in September 1999. Data collected by a variety of organizations confirms that clarity has remained relatively stable at Griffy Lake over the past 16 years (JFNew 2008).

5.0 PRESENT WATER BODY USES

Griffy Lake and the immediate surroundings are owned by the city of Bloomington and managed by the Bloomington Parks and Recreation department. Griffy Lake is still maintained as a back-up water supply to the city of Bloomington even though the water treatment plant was decommissioned in 1995 (JFNew 2008). There are no permanent dwellings on the shoreline of Griffy Lake. Griffy Lake attracts numerous visitors from the Bloomington area. It is a very popular place for boating, fishing, picnicking, hiking, and environmental education. A more detailed report on Griffy Lake and nature preserve usage can be found in the recently completed *Griffy Lake Nature Preserve Master Plan* (JFNew 2008). No fisheries assessments were completed on Griffy Lake in 2008.

6.0 AQUATIC VEGETATION SAMPLING RESULTS

Griffy Lake was surveyed on four different occasions in 2008. Aquatic Control completed an Invasive Species Mapping Survey on April 9 and three Tier II surveys on May 5th, July 8th, and August 28th.

6.1 Invasive Species Mapping Survey

An Invasive Species Mapping Survey was completed on April 9th, 2008 in order to locate areas of curlyleaf pondweed and Eurasian watermilfoil prior to treatment. Littoral zone areas were surveyed with a 16 ft aluminum boat equipped with an outboard motor and sonar devices. The boat was driven in a zig-zag pattern over the littoral area. Rakes were tossed on numerous occasions and visual observations were made. Waypoints were recorded when the survey crew encountered either curlyleaf pondweed or Eurasian watermilfiol. This data was used to create a map identifying areas of invasive species. No Eurasian watermilfoil or Brazilian elodea was detected during the survey. However, curlyleaf pondweed was found to encompass 15.7 acre area (Figure 3). Horned pondweed (*Zanichellia palustris*) was observed growing in the upper end of the lake.

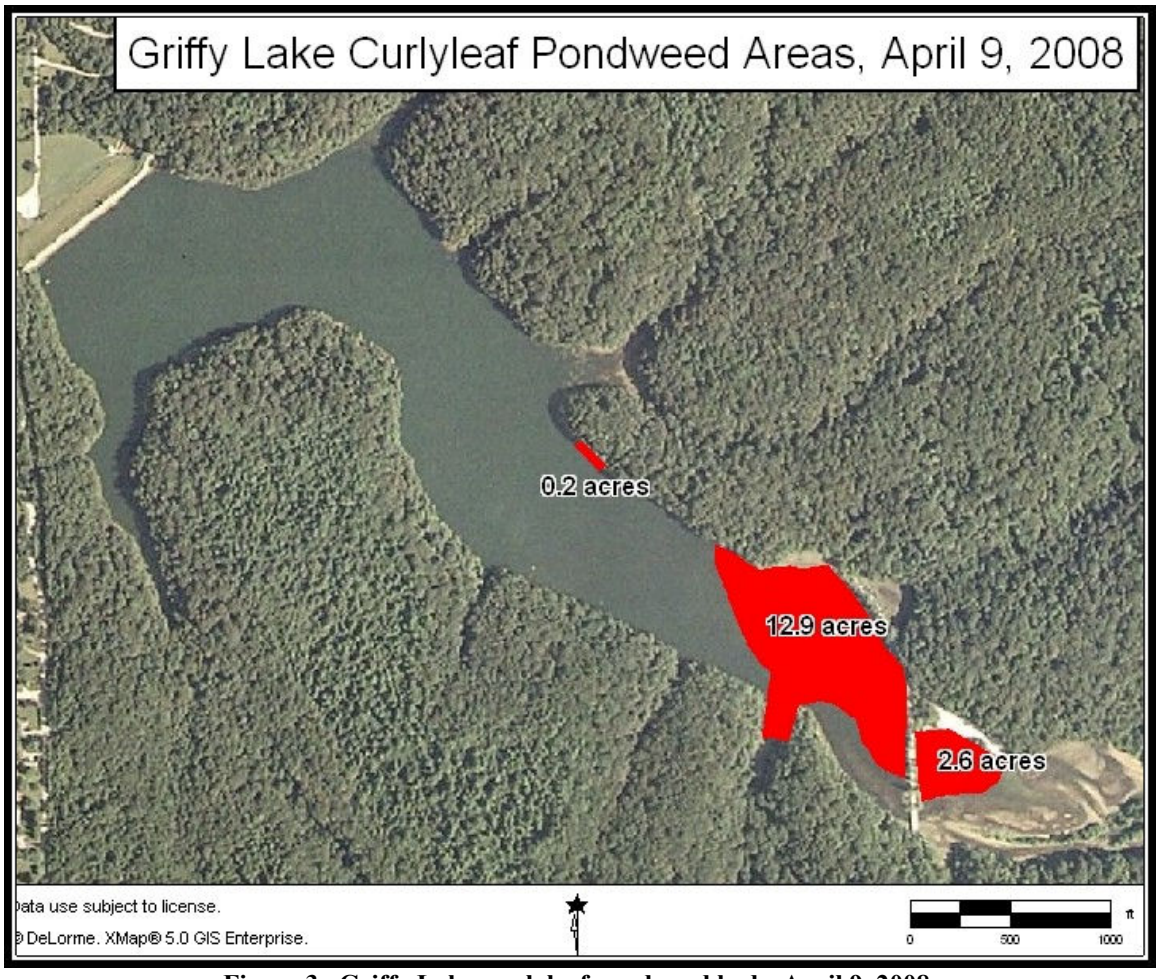

Figure 3. Griffy Lake, curlyleaf pondweed beds, April 9, 2008.

6.2 Tier II Surveys

Three Tier II surveys were completed in 2008. The primary purpose of these surveys was to detect any remaining Brazilian elodea. In addition, the surveys also served as a tool to track the recovery of the native plant community following the 2006 and 2007 whole lake treatments. The 2008 Tier II protocol was the same as 2007 (IDNR 2006) and the same 100 points that were sampled in 2007 were again used in the 2008 surveys.

6.2.1 Tier II Survey-May 5, 2008

Aquatic Control completed a Tier II survey on May 5th, 2008. A dissolved oxygen temperature profile was taken near the dam and the results are summarized in Table 1. A Secchi disk reading of 9.0 feet was recorded at the same location.

Table 1. Griffy Lake, Dissolved Oxygen/Temperature Profile, May 5, 2008.

Depth (ft)	Temperature (F)	Dissolved Oxygen (mg/L)
0	66.5	9.7
3	66.1	9.6
6	65.8	9.5
9	65.6	9.5
12	65.3	9.4
15	64.6	9.2
18	60.8	7.7
21	56.3	7.0
24	54.2	6.3
27	52.3	1.8
30	49.9	0.8

The results of the sampling are located in Table 2. The same 100 sites that were sampled in 2007 were sampled again in this survey in order to allow for an accurate comparison. Submersed vegetation was collected at 39% of the sites and plants were growing to a maximum depth of 12.0 feet (Figure 4). Only three species were collected of which two were native. Curlyleaf pondweed occurred at the highest number of sites (Figure 5). However, most of the curlyleaf plants were deteriorated and showing the effects of a treatment which was completed two weeks prior to the survey. Chara (*Chara sp.)* was the second most abundant species throughout the lake, but was the most abundant species in 0-5 foot of water (Figure 6). Horned pondweed, a species classified as rare in the state of Indiana, was collected at four sites (Figure 7).

Table 2. Griffy Lake, Occurrence and Abundance of Aquatic Plants, May 5, 2008.

Occurrence and abundance of submersed aquatic plants in Griffy Lake

County:	Monroe	Sites with plants:	39	Mean species/site:	0.44
Date:	5.5.08	Sites with native plants:	39	Standard error (ms/s):	0.05915226
Secchi (ft):	9	Number of species:	3	Mean native species/site:	0.44
Maximum plant depth (ft):	12	Number of native species:	2	Standard error (mns/s):	0.05915226
Trophic status	Mesotrophic	Maximum species/site:	2	Species diversity:	0.57
Total sites:	100			Native species diversity:	0.31

Depths 0 to 12 ft	Frequency of	Rake score frequency per species				Plant
Species	Occurrence	0	1	3	5	Dominance
curlyleaf pondweed	23.0	77.0	10.0	9.0	4.0	10.6
Chara	17.0	83.0	12.0	0.0	5.0	6.6
horned pondweed	4.0	96.0	3.0	0.0	1.0	0.8

Depths 0 to 5 ft	Frequency of	Rake score frequency per species				Plant
Species	Occurrence	0	1	3	5	Dominance
Chara	20.0	80.0	6.7	0.0	13.3	14.7
curlyleaf pondweed	13.3	86.7	6.7	3.3	3.3	4.0
horned pondweed	13.3	86.7	10.0	0.0	3.3	2.7

Depths 5 to 10 ft	Frequency of	Rake score frequency per species				Plant
Species	Occurrence	0	1	3	5	Dominance
curlyleaf pondweed	30.6	69.4	0.0	14.3	6.1	16.7
Chara	22.4	77.6	20.4	0.0	2.0	4.5

Depths 10 to 12 ft	Frequency of	Rake score frequency per species				Plant
Species	Occurrence	0	1	3	5	Dominance
curlyleaf pondweed	26.7	73.3	20.0	6.7	0.0	8.0

Species Observed: Water willow and creeping water primrose

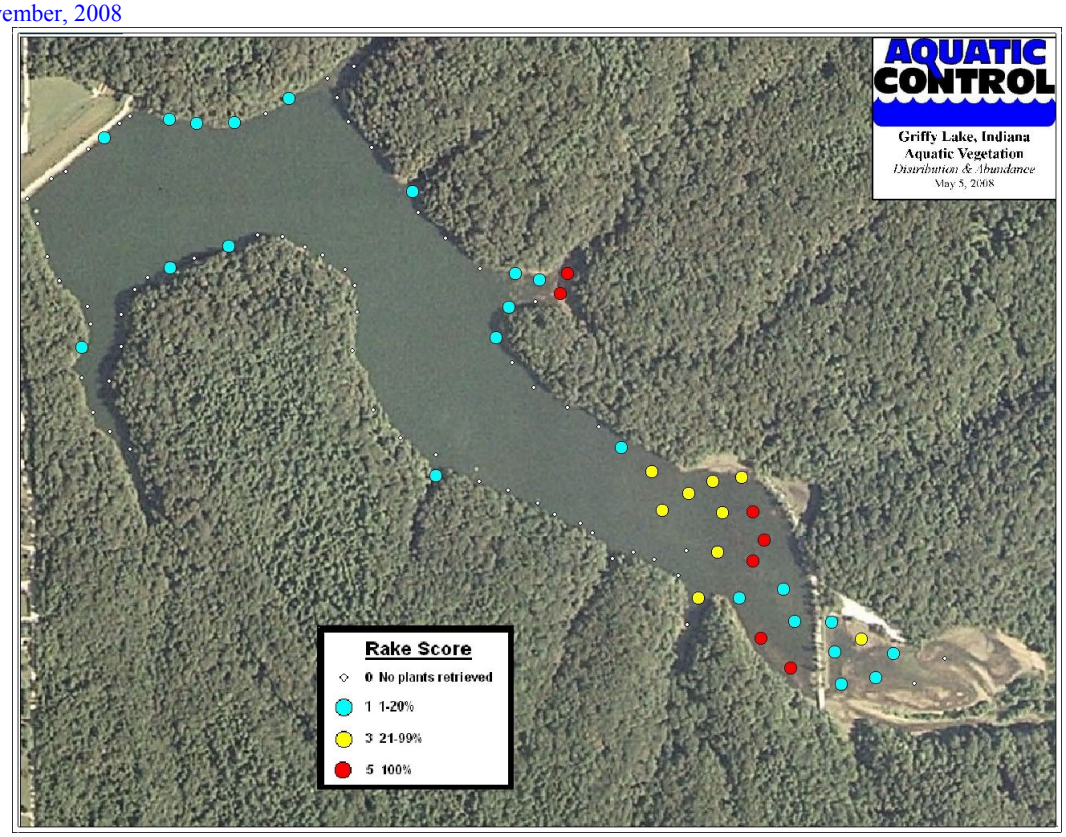

Figure 4. Griffy Lake, aquatic vegetation distribution and abundance, May 5, 2008.

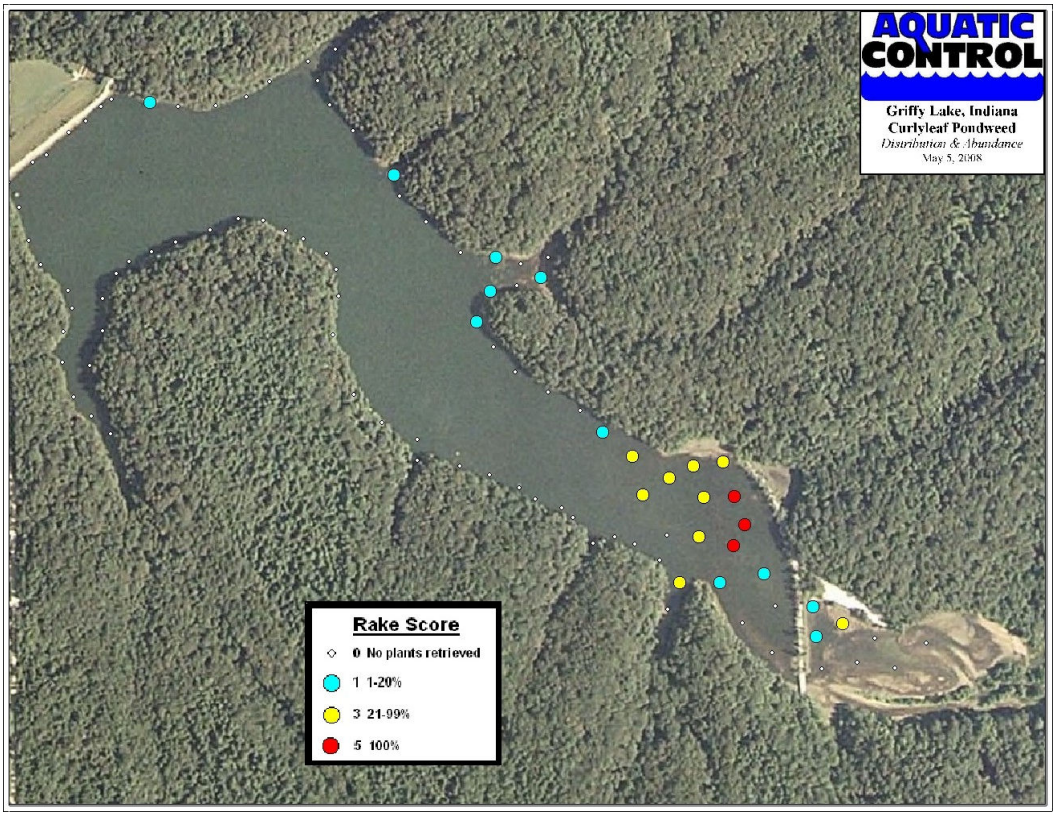

Figure 5. Griffy Lake, curyleaf pondweed distribution and abundance, May 5, 2008.

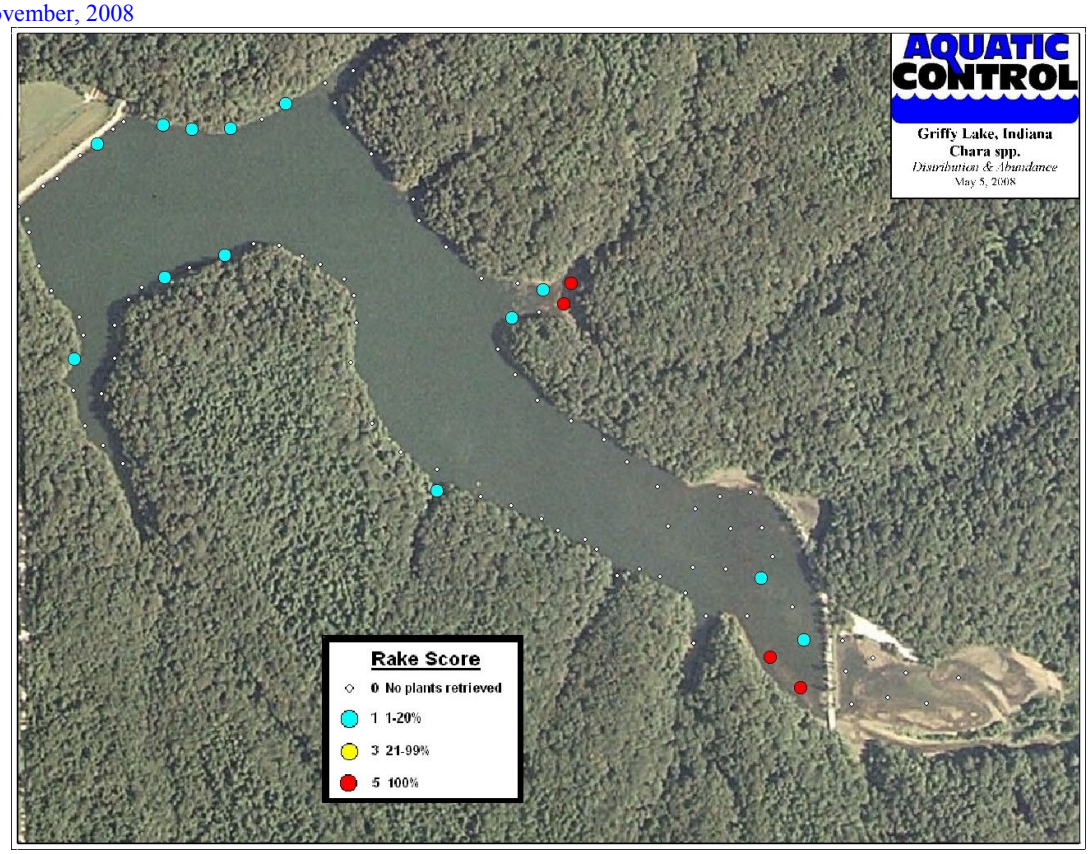

Figure 6. Griffy Lake, chara distribution and abundance, May 5, 2008.

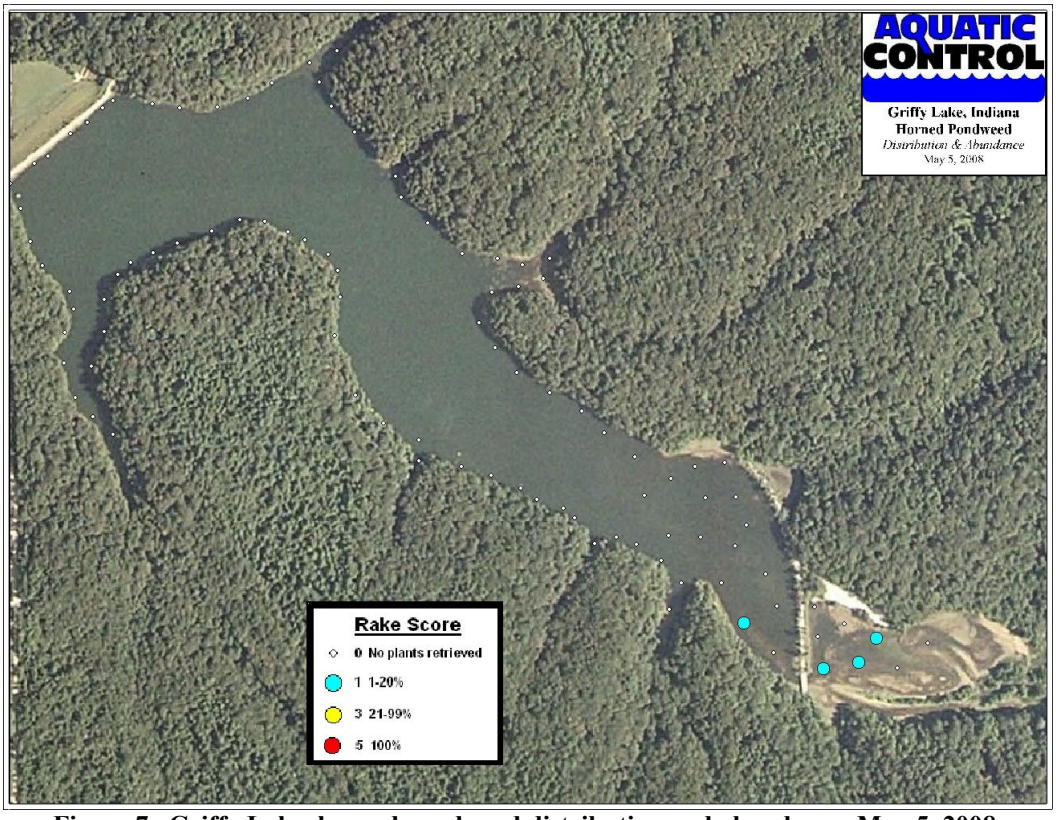

Figure 7. Griffy Lake, horned pondweed distribution and abundance, May 5, 2008.

6.2.2 Tier II Survey-July 8, 2008

Aquatic Control completed the second Tier II survey on July 8th, 2008. A dissolved oxygen temperature profile was taken near the dam and the results are summarized in Table 3. There appeared to be strong stratification between 9.0 and 12.0 feet. A Secchi disk reading of 10.0 feet was recorded at the same location.

Table 3. Griffy Lake, dissolved oxygen/temperature profile, July 8, 2008.

Depth (ft)	Temperature (F)	Dissolved Oxygen (mg/L)
0	78.9	8.9
3	78.3	9.0
6	78.1	9.0
9	76.6	7.0
12	70.2	0.8
15	65.0	0.1
18	61.0	0.1
21	55.9	0.1
24	53.8	0.1
27	52.5	0.1
30	51.2	0.1

The same 100 sites were sampled and submersed vegetation was collected at 27% of the sites and plants were growing to a maximum depth of 15.0 feet (Table 4 & Figure 8). Seven species were collected of which 5 were native. Chara occurred at the highest percentage of sites (Figure 9). Brittle naiad (*Najas minor*) was the second most frequently occurring species and was sampled at 10% of sites (Figure 10). Leafy pondweed (*Potamogeton foliosus*), sago pondweed (*Potamogeton pectinatus*), horned pondweed, Eurasian watermilfoil, and American elodea (*Elodea canidensis*) all occurred at less than 10% of sites (Figures 11-15).

Table 4. Griffy Lake, Occurrence and Abundance of Aquatic Plants, July 8, 2008.

Occurrence and abundance of submersed aquatic plants in Griffy Lake

County:	Monroe	Sites with plants:	27	Mean species/site:	0.39
Date:	7/8/2008	Sites with native plants:	25	Standard error (ms/s):	0.07506899
Secchi (ft):	10	Number of species:	7	Mean native species/site:	0.37
Maximum plant depth (ft):	15	Number of native species:	6	Standard error (mns/s):	0.07474536
Trophic status	Mesotrophic	Maximum species/site:	3	Species diversity:	0.75
Total sites:	100			Native species diversity:	0.73

Depths 0 to 15 ft	Frequency of	Rake score frequency per species				Plant
Species	Occurrence	0	1	3	5	Dominance
Chara	15.0	85.0	8.0	3.0	4.0	6.6
Brittle naiad	10.0	90.0	6.0	4.0	0.0	2.0
leafy pondweed	5.0	95.0	2.0	3.0	0.0	1.4
sago pondweed	3.0	97.0	2.0	1.0	0.0	0.6
horned pondweed	3.0	97.0	2.0	0.0	1.0	0.6
Eurasian watermilfoil	2.0	98.0	2.0	0.0	0.0	0.4
American elodea	1.0	99.0	0.0	0.0	1.0	0.2

Depths 0 to 5 ft	Frequency of	Rake score frequency per species				Plant
Species	Occurrence	0	1	3	5	Dominance
Chara	26.5	73.5	8.8	8.8	8.8	13.5
Brittle naiad	17.6	82.4	5.9	11.8	0.0	3.5
leafy pondweed	14.7	85.3	5.9	8.8	0.0	4.1
horned pondweed	8.8	91.2	5.9	0.0	2.9	1.8
sago pondweed	5.9	94.1	2.9	2.9	0.0	1.2
American elodea	2.9	97.1	0.0	0.0	2.9	0.6

Depths 5 to 10 ft	Frequency of	Rake score frequency per species				Plant
Species	Occurrence	0	1	3	5	Dominance
Chara	15.0	85.0	12.5	0.0	2.5	5.0
Brittle naiad	10.0	90.0	10.0	0.0	0.0	2.0
Eurasian watermilfoil	2.5	97.5	2.5	0.0	0.0	0.5
sago pondweed	2.5	97.5	2.5	0.0	0.0	0.5

Depths 10 to 15 ft	Frequency of	Rake score frequency per species				Plant
Species	Occurrence	0	1	3	5	Dominance
Eurasian watermilfoil	5.0	95.0	5.0	0.0	0.0	1.0

Species Observed: Creeping water primrose, water willow, duckweed, curlyleaf pondweed

AQUATIC CONTROL

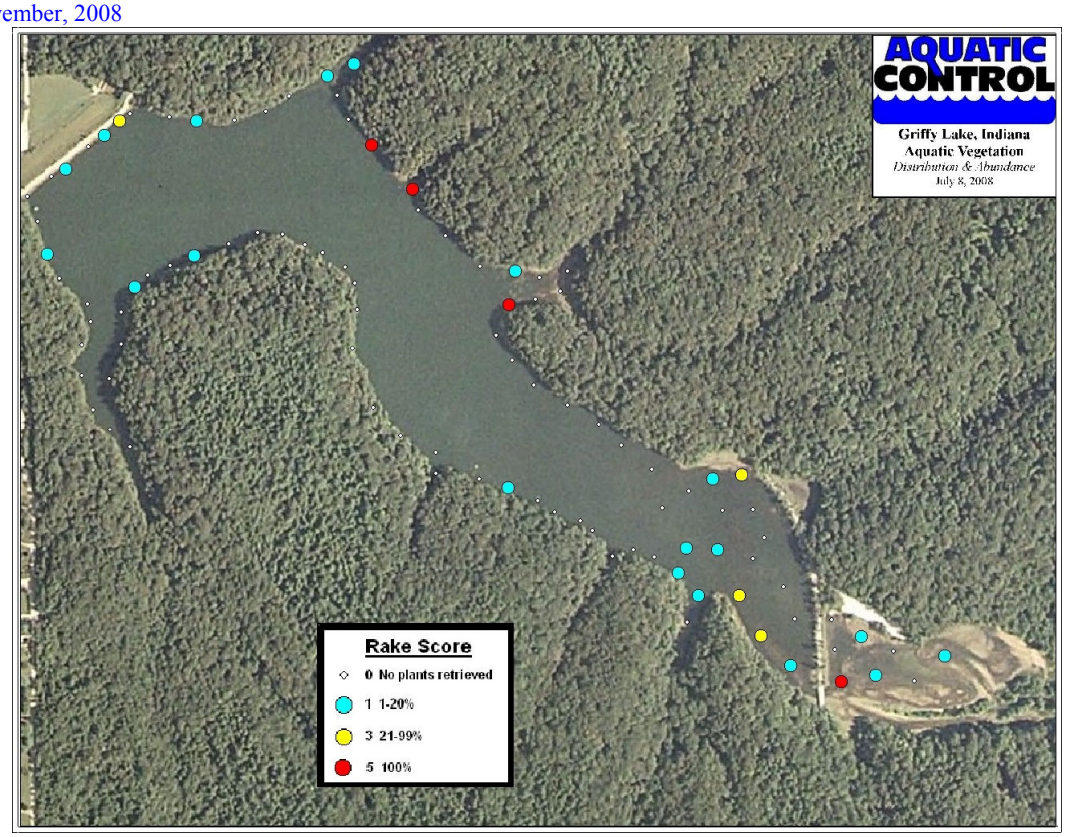

Figure 8. Griffy Lake, aquatic vegetation distribution and abundance, July 8, 2008.

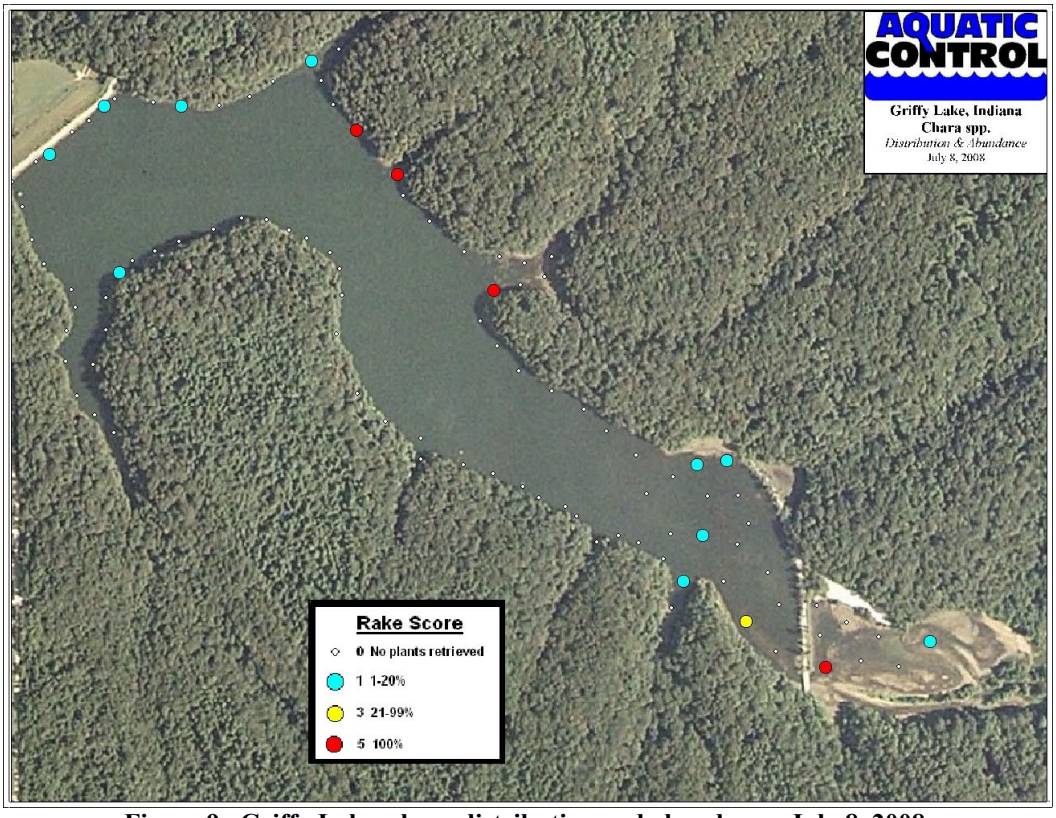

Figure 9. Griffy Lake, chara distribution and abundance, July 8, 2008.

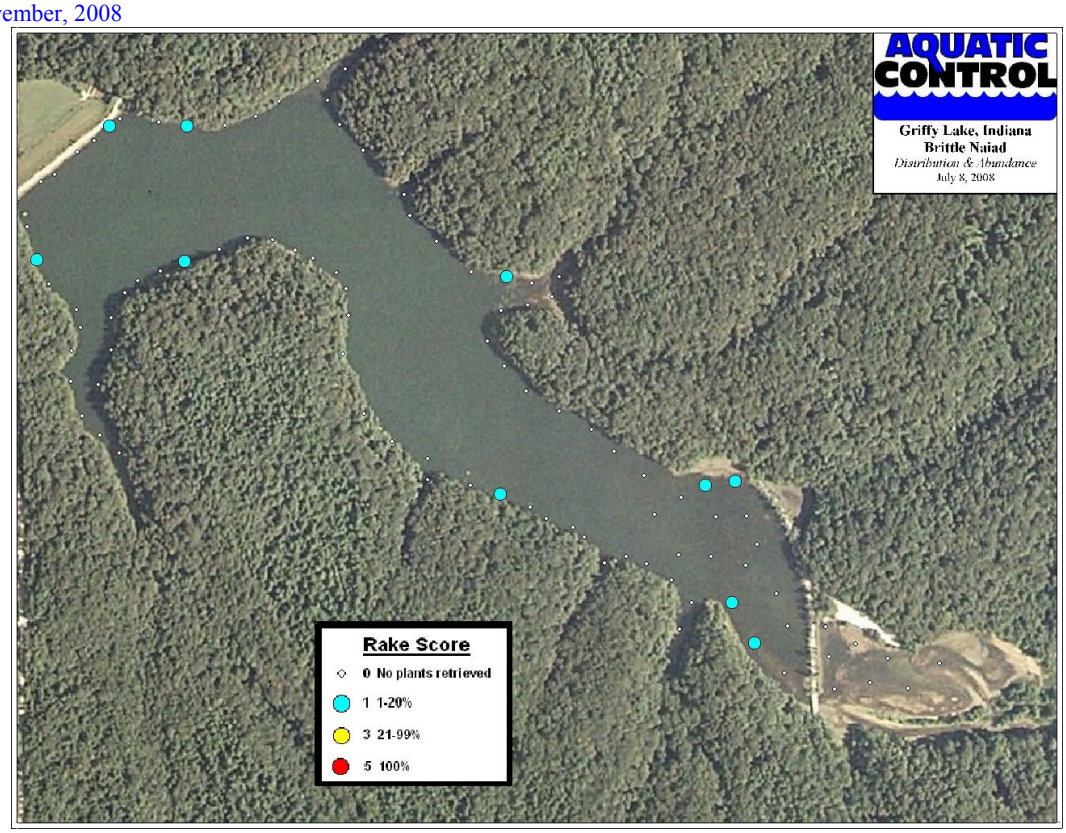

Figure 10. Griffy Lake, brittle naiad distribution and abundance, July 8, 2008.

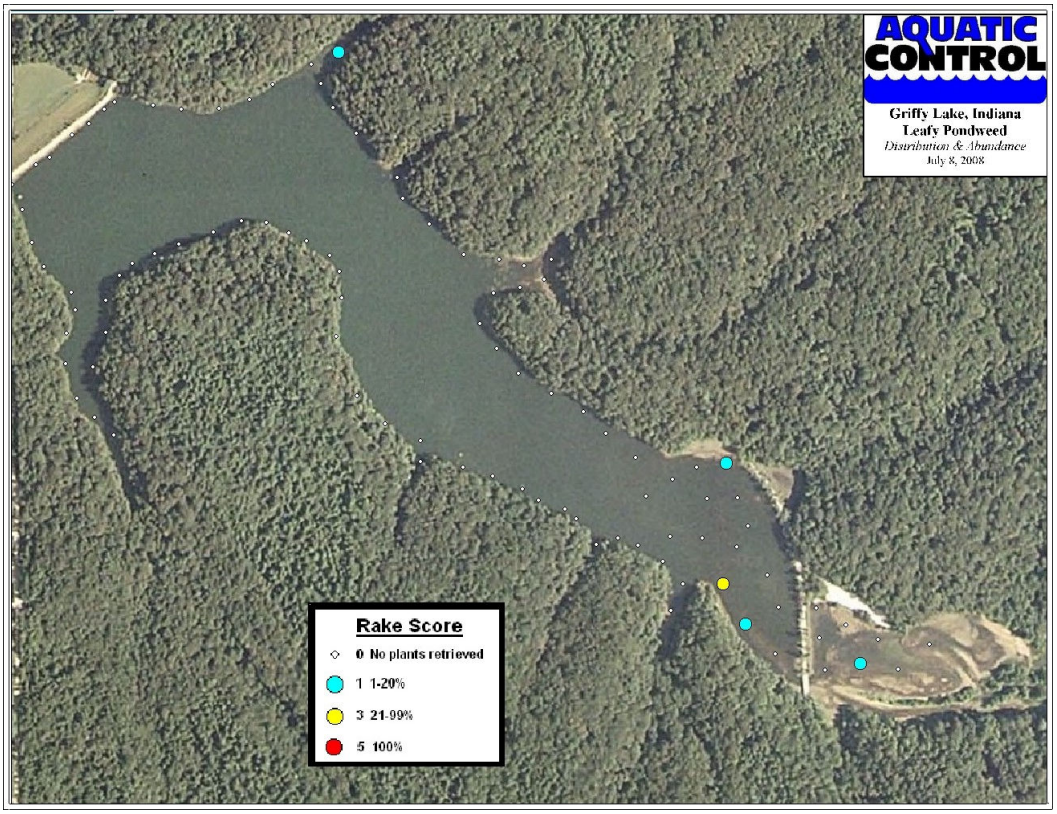

Figure 11. Griffy Lake, leafy pondweed distribution and abundance, July 8, 2008.

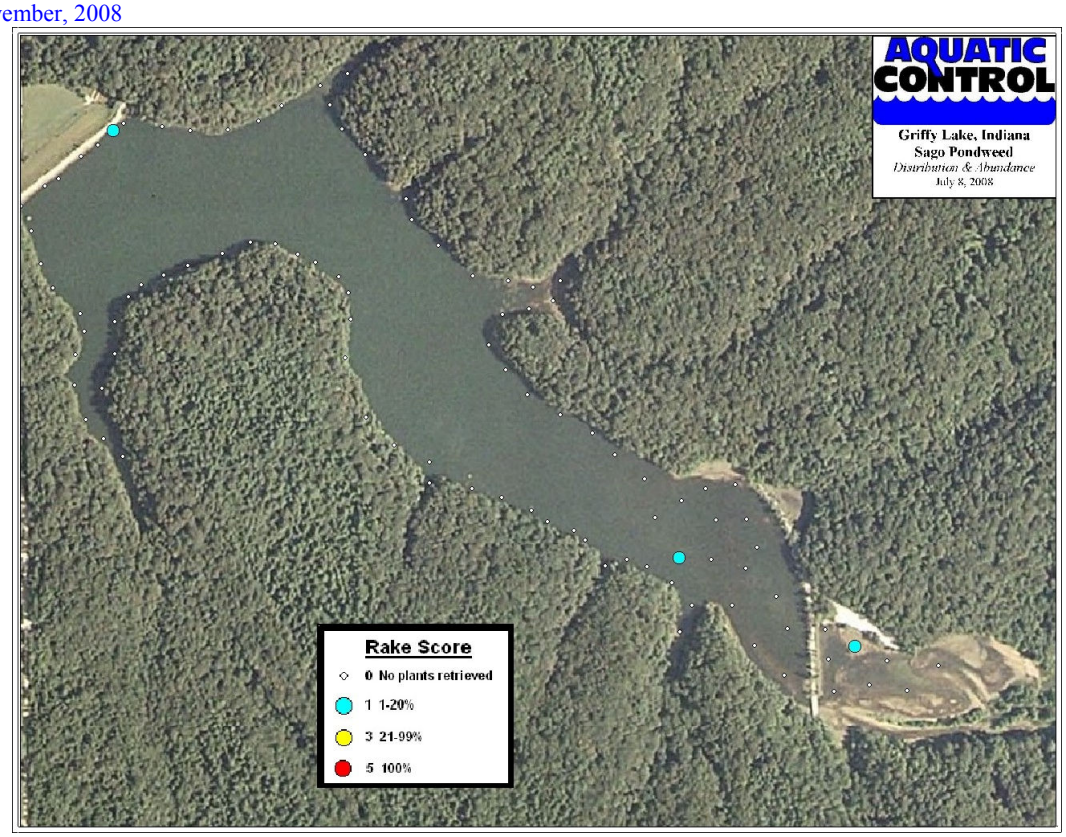

Figure 12. Griffy Lake, sago pondweed distribution and abundance, July 8, 2008.

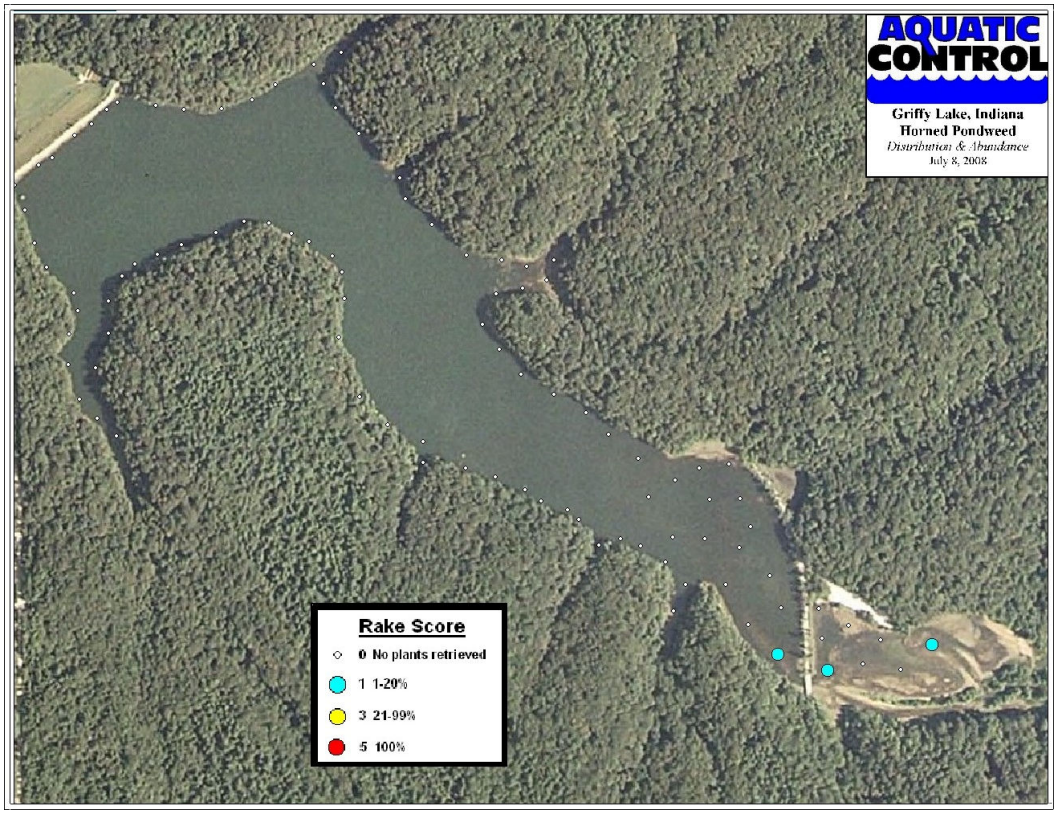

Figure 13. Griffy Lake, horned pondweed distribution and abundance, July 8, 2008.

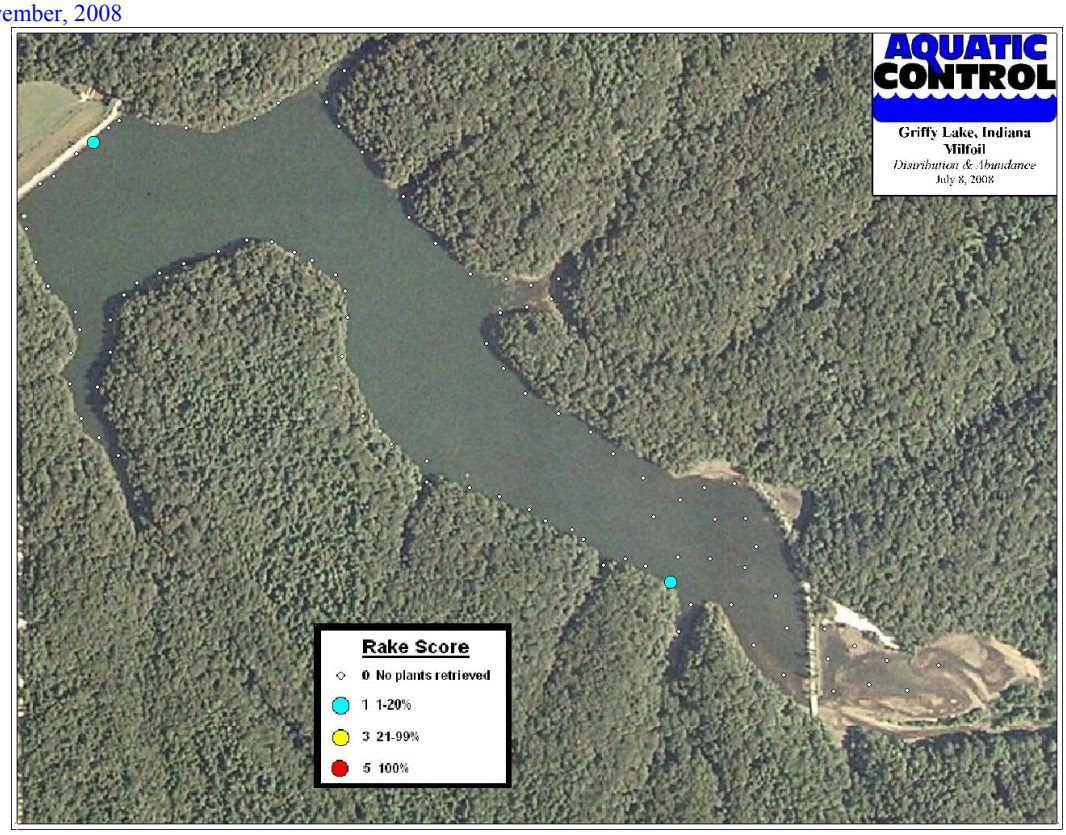

Figure 14. Griffy Lake, Eurasian watermilfoil distribution and abundance, July 8, 2008.

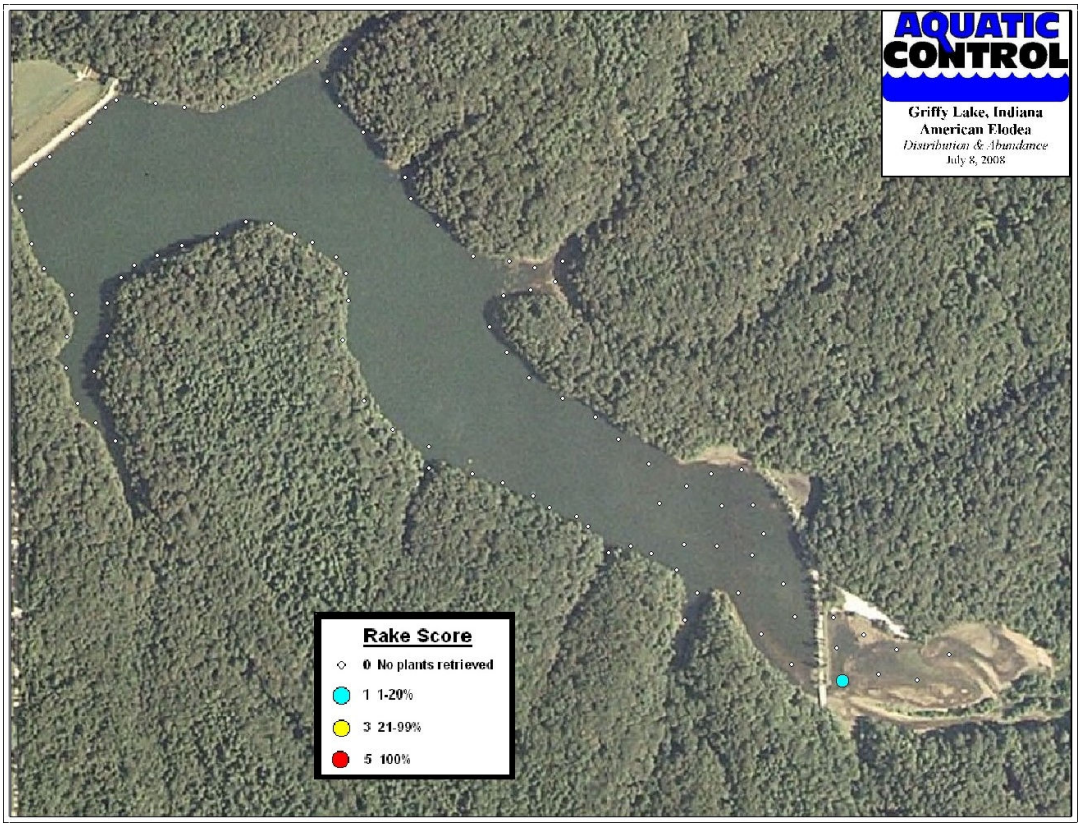

Figure 15. Griffy Lake, American elodea distribution and abundance, July 8, 2008.

6.2.3 Tier II Survey-August 26, 2008

Aquatic Control completed the final Tier II survey on August 26th, 2008. Results of the dissolved oxygen/temperature profile are summarized in Table 5. The profile indicated that the thermocline had moved deeper when compared to the July survey. A Secchi disk reading of 12.0 feet was recorded at the same location.

Table 5. Griffy Lake, dissolved oxygen/temperature profile, August 26, 2008.

Depth (ft)	Temperature (F)	Dissolved Oxygen (mg/L)
0	78.9	8.8
3	79.1	8.5
6	79.3	8.5
9	79.4	8.6
12	79.4	8.6
15	75.0	4.3
18	70.0	4.1
21	61.0	0.5
24	58.6	0.3
27	55.8	0.2
30	54.3	0.2

The same 100 sites that were sampled and submersed vegetation was present at 58% of the sites and growing to a maximum depth of 15.0 feet (Table 6 & Figure 16). Seven species were collected of which 5 were native. Brittle naiad had dramatically expanded since the last survey and now occurred at the highest percentage of sites (Figure 17). Chara, slender naiad (*Najas flexilus*), and leafy pondweed were all present at 10% of sites (Figures 18-20). Sago pondweed was found at 9% of sites, while Eurasian watermilfoil and horned pondweed were only collected at a single site (Figures 21-23). Illinois pondweed and common coontail were observed for the first time since the fluridone treatment, but they were not collected during actual rake sampling.

Table 6. Griffy Lake, Occurrence and Abundance of Aquatic Plants, August 26, 2008.

Occurrence and abundance of submersed aquatic plants in Griffy Lake

County:	Monroe	Sites with plants:	58	Mean species/site:	0.95
Date:	8/26/2008	Sites with native plants:	29	Standard error (ms/s):	0.10480863
Secchi (ft):	12	Number of species:	7	Mean native species/site:	0.40
Maximum plant depth (ft):	15	Number of native species:	5	Standard error (mns/s):	0.07106691
Trophic status	Mesotrophic	Maximum species/site:	4	Species diversity:	0.63
Total sites:	100			Native species diversity:	0.63

Depths 0 to 15 ft	Frequency of Occurrence	Rake score frequency per species				Plant Dominance
Species		0	1	3	5	
Brittle naiad	54.0	46.0	17.0	16.0	21.0	31.6
Chara	10.0	90.0	2.0	2.0	6.0	4.0
slender naiad	10.0	90.0	4.0	3.0	3.0	2.0
leafy pondweed	10.0	90.0	4.0	4.0	2.0	2.0
sago pondweed	9.0	91.0	3.0	3.0	3.0	3.4
Eurasian watermilfoil	1.0	99.0	0.0	1.0	0.0	0.2
horned pondweed	1.0	99.0	0.0	0.0	1.0	0.2

Depths 0 to 5 ft	Frequency of Occurrence	Rake score frequency per species				Plant Dominance
Species		0	1	3	5	
Brittle naiad	82.9	17.1	22.9	14.3	45.7	52.0
Chara	25.7	74.3	2.9	5.7	17.1	10.9
leafy pondweed	17.1	82.9	11.4	2.9	2.9	3.4
slender naiad	11.4	88.6	0.0	2.9	8.6	2.3
sago pondweed	11.4	88.6	5.7	0.0	5.7	6.9
horned pondweed	2.9	97.1	0.0	0.0	2.9	0.6

Depths 5 to 10 ft	Frequency of Occurrence	Rake score frequency per species				Plant Dominance
Species		0	1	3	5	
Brittle naiad	52.5	47.5	17.5	22.5	12.5	29.5
slender naiad	12.5	87.5	7.5	5.0	0.0	2.5
sago pondweed	10.0	90.0	2.5	5.0	2.5	2.0
leafy pondweed	10.0	90.0	0.0	7.5	2.5	2.0
Eurasian watermilfoil	2.5	97.5	0.0	2.5	0.0	0.5

Depths 10 to 15 ft	Frequency of Occurrence	Rake score frequency per species				Plant Dominance
Species		0	1	3	5	
Brittle naiad	8.7	91.3	8.7	8.7	0.0	7.0
Chara	4.3	95.7	4.3	0.0	0.0	0.9
slender naiad	4.3	95.7	4.3	0.0	0.0	0.9
sago pondweed	4.3	95.7	0.0	4.3	0.0	0.9

Species Observed: Arrow arum, Hibiscus sp., Common cattail, Creeping water primrose, Water willow, Curlyleaf pondweed, Common coontail, Illinois pondweed

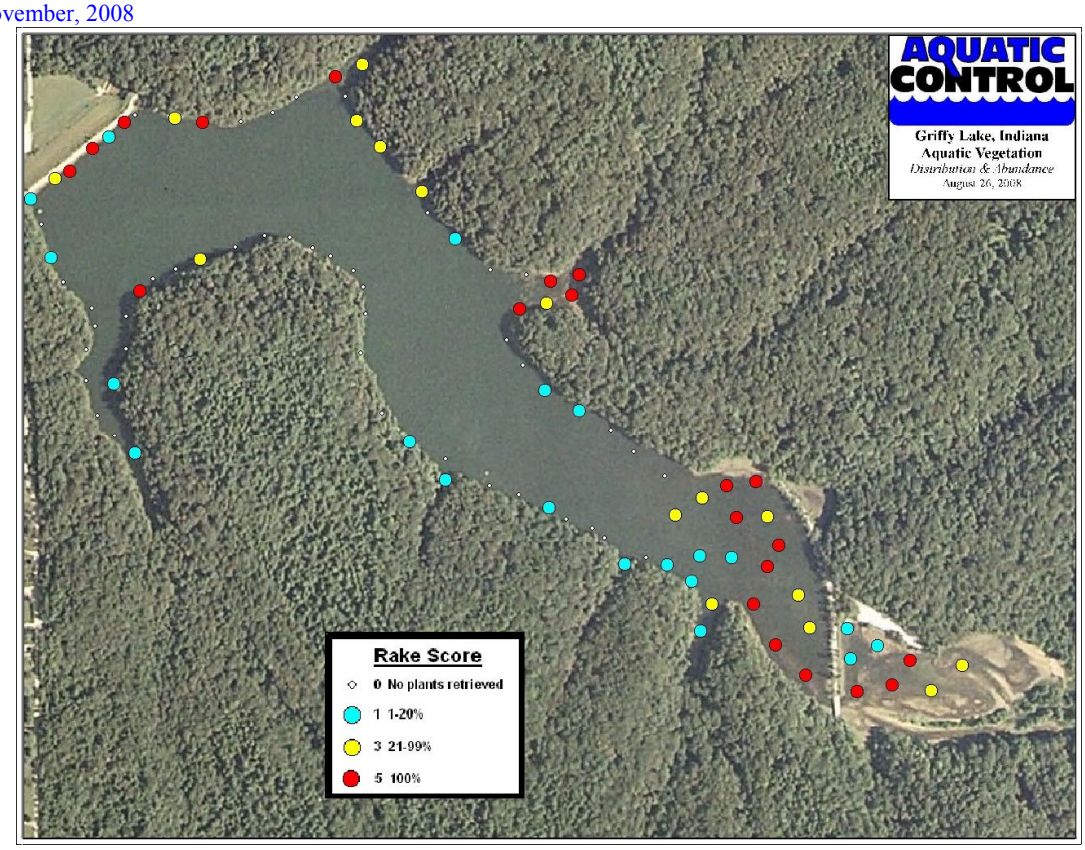

Figure 16. Griffy Lake, aquatic vegetation distribution and abundance, August 26, 2008.

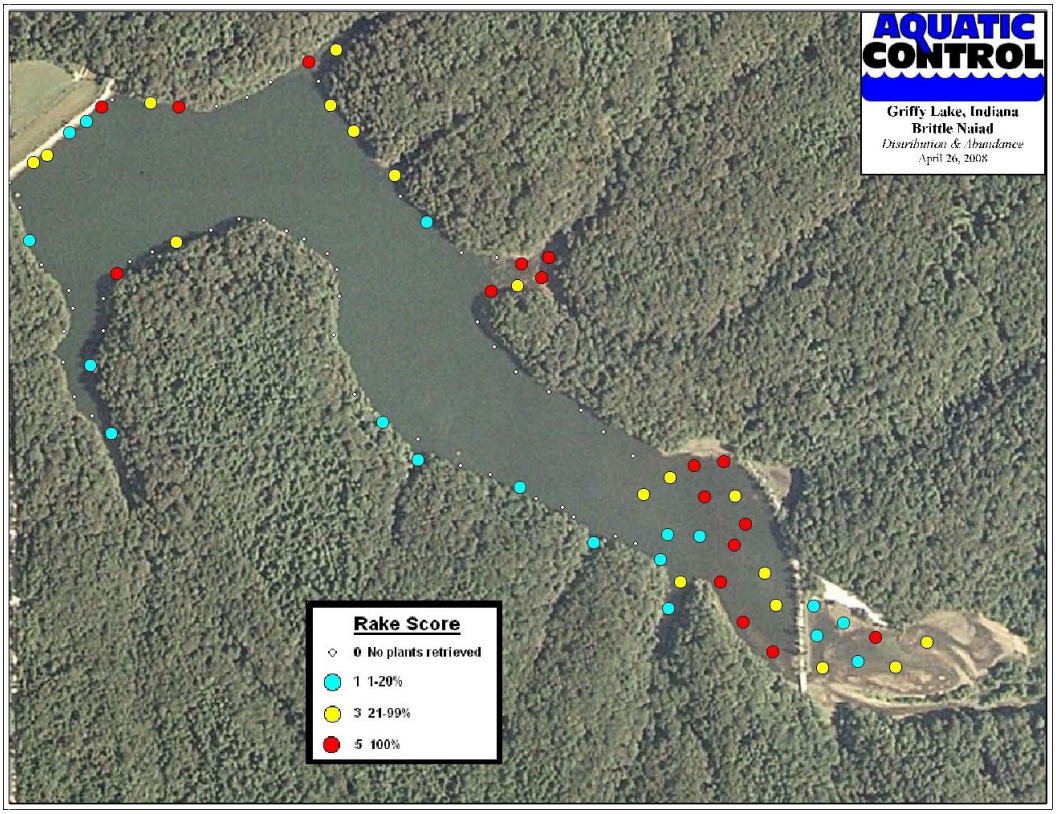

Figure 17. Griffy Lake, brittle naiad distribution and abundance, August 26, 2008.

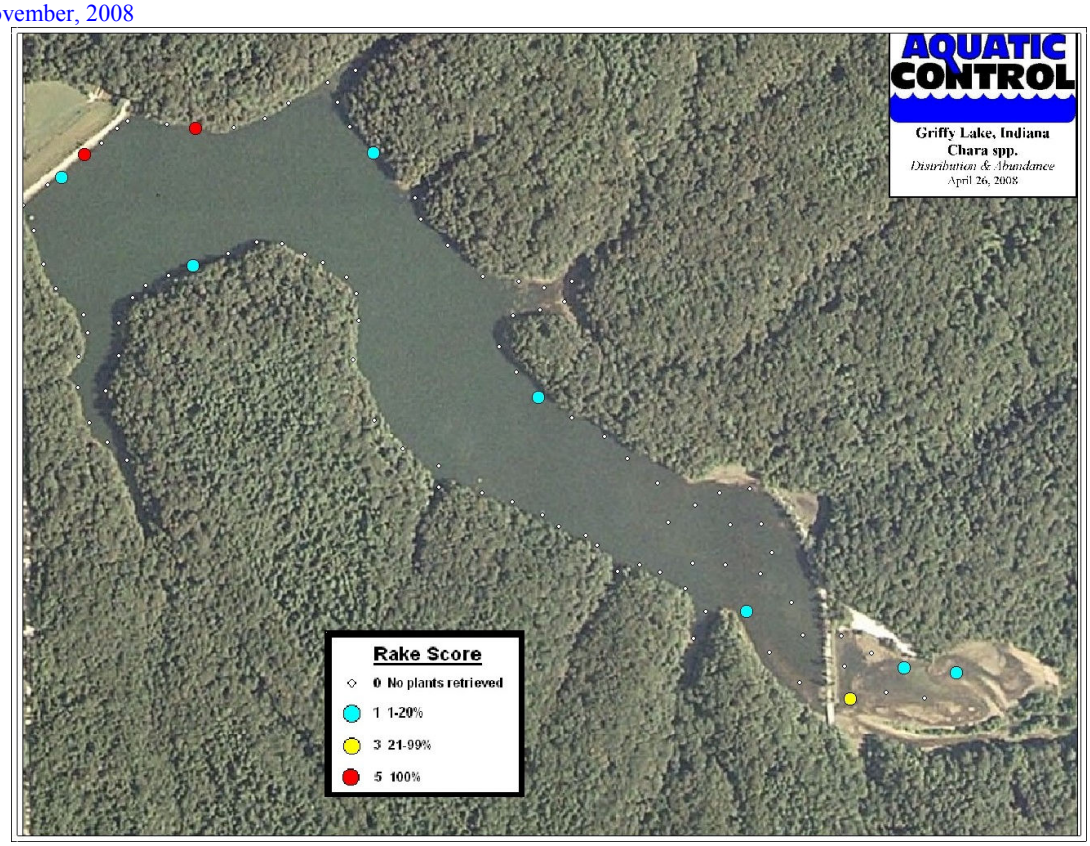

Figure 18. Griffy Lake, chara distribution and abundance, August 26, 2008.

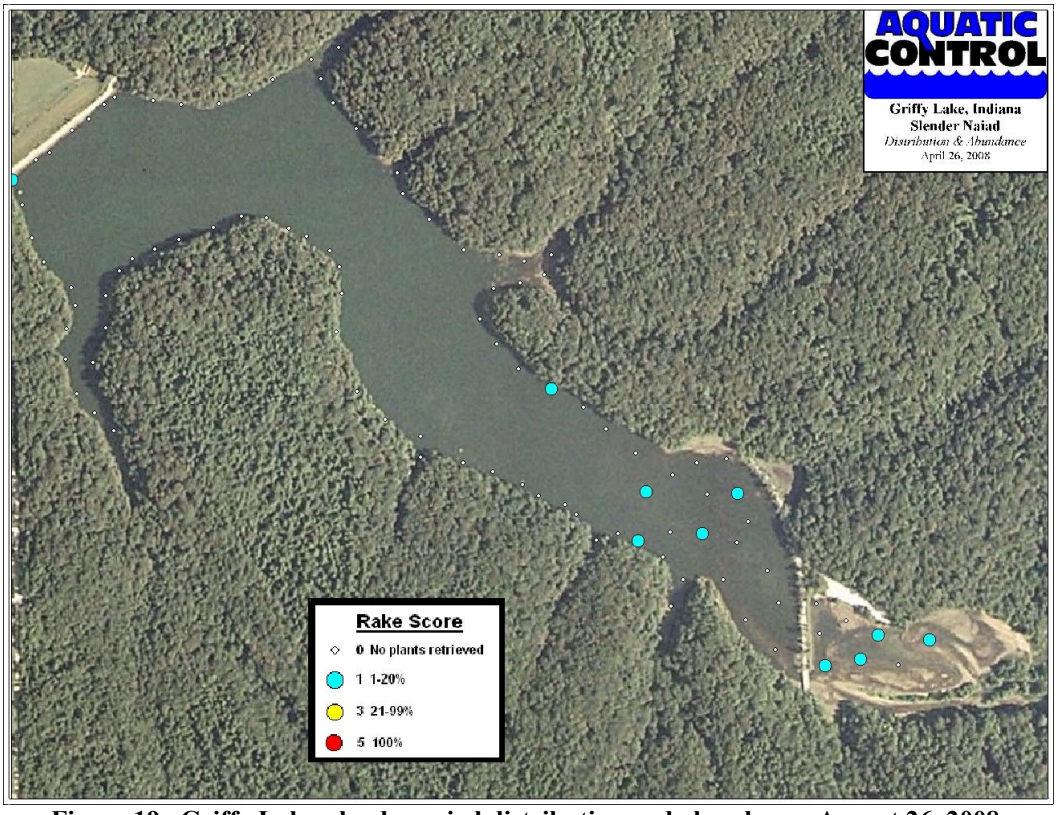

Figure 19. Griffy Lake, slender naiad distribution and abundance, August 26, 2008.

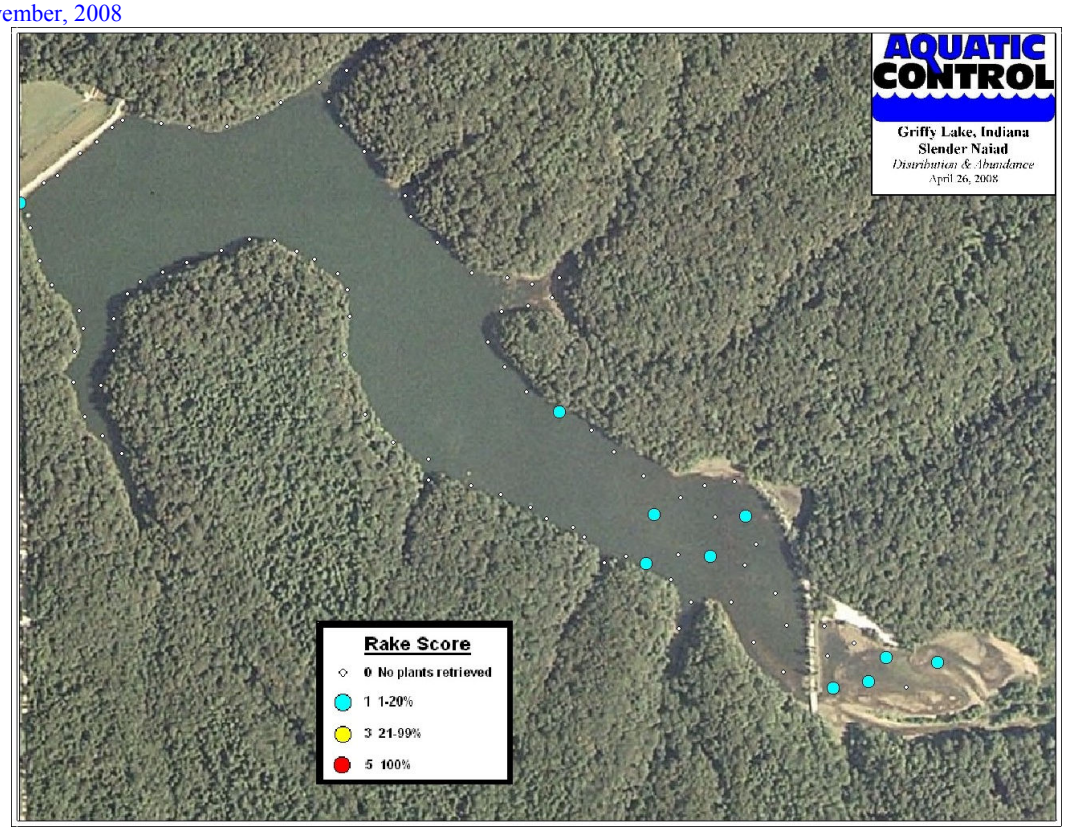

Figure 20. Griffy Lake, leafy pondweed distribution and abundance, August 26, 2008.

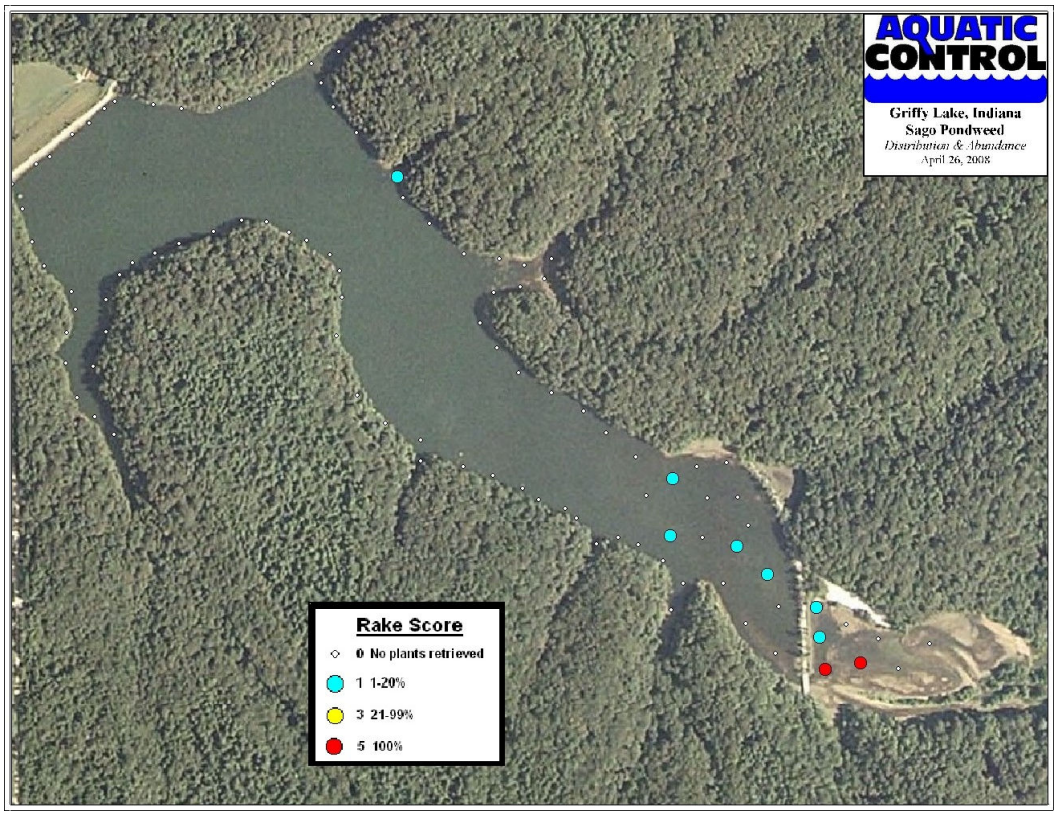

Figure 21. Griffy Lake, sago pondweed distribution and abundance, August 26, 2008.

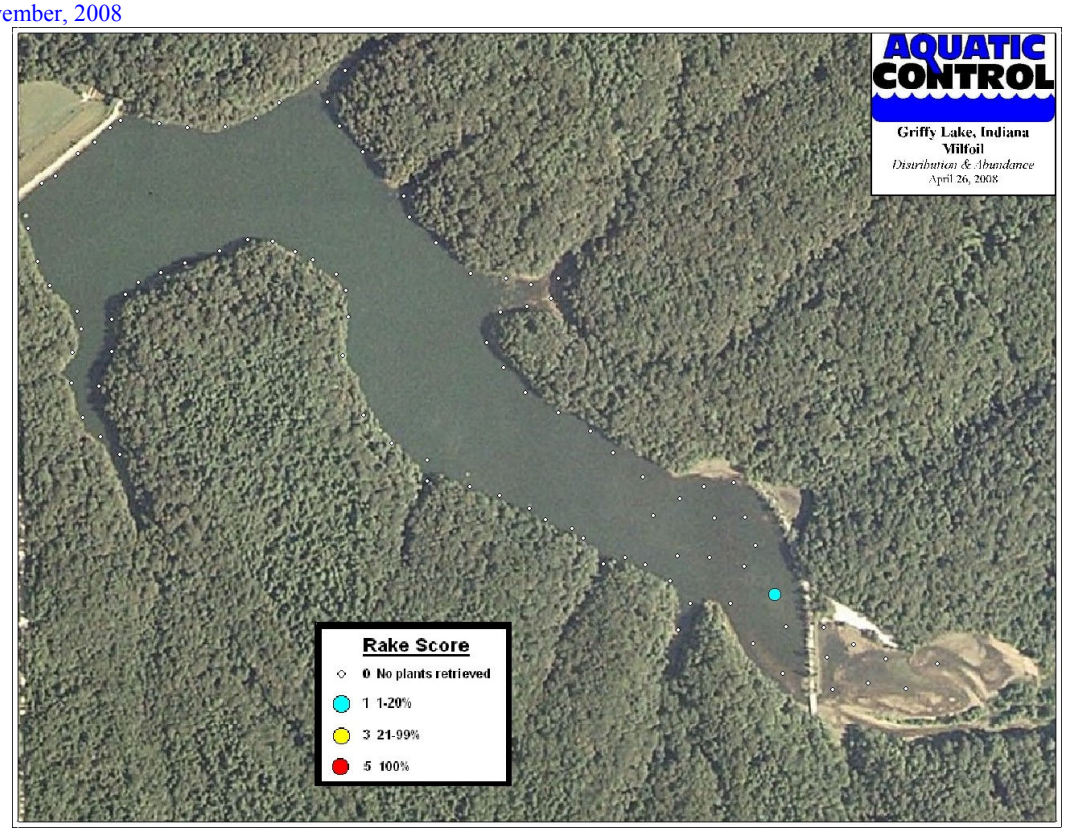

Figure 22. Griffy Lake, Eurasian watermilfoil distribution and abundance, August 26, 2008.

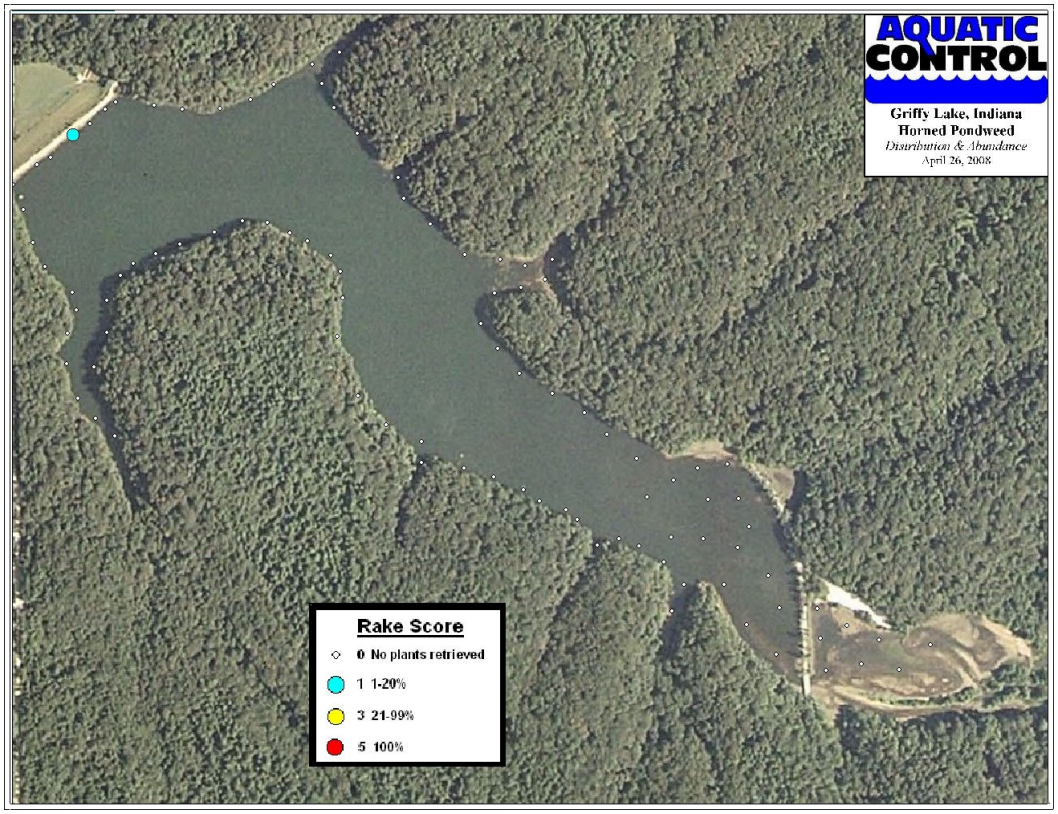

Figure 23. Griffy Lake, horned pondweed distribution and abundance, August 26, 2008.

6.3 Aquatic Vegetation Sampling Discussion

The primary goal of the vegetation management plan is the eradication of Brazilian elodea. In order to meet this goal, whole lake fluridone treatments were completed in 2006 and 2007. The focus of this years sampling was on the detection of Brazilian elodea and none was detected. It may be too early to declare this species eradicated, but it appears that we are moving in the right direction towards obtaining this goal.

Brazilian elodea was not the only invasive species found during previous sampling. Eurasian watermilfoil was also abundant prior to the fluridone applications. This species is very susceptible to fluridone at low rates and was not collected during the August 2006 or 2007 sampling. However, following the 2008 floods milfoil was detected in Griffy Lake. It is likely that this species is present in the watershed, but the location has yet to be discovered (Lake Tameron was suspected, but no milfoil was detected following inspection by Bloomington Parks personnel). Continued vigilance will be needed to keep this species at low levels.

Curlyleaf pondweed is another invasive exotic species in Griffy Lake. This plant was damaged by the treatment but returned in 2008 due to presence of reproductive structures called turions (curlyleaf pondweed turions are not affected by herbicide and can remain viable in the bottom sediments for several years). Treatments in 2008 appeared to be effective at controlling this plant and likely prevented production of new turions. Controls should continue in order to prevent this species from spreading to areas previously occupied by Eurasian watermilfoil and Brazilian elodea. Invasive species sampling should be completed in April of 2009 in order to detect areas of curlyleaf pondweed. Treatments may need to be completed for 1-2 more seasons in order to exhaust the turion bank.

Yet another invasive species has begun to gain a foothold in Griffy Lake. Brittle naiad is listed as an invasive species in Indiana's Aquatic Nuisance Species Management Plan (IDNR 2003). However, it is rather uncommon to see brittle naiad at nuisance levels in Indiana lakes. Brittle naiad was present in Griffy Lake prior to the fluridone treatments, but was not as abundant as Eurasian watermilfiol, curlyleaf pondweed, or Brazilian eldodea. Due to this plants ability to reproduce through seed production it appears that it is replacing the other invasive species in many areas of the lake. This is exhibited by the five-fold increase in percent occurrence observed from July to August of 2008 (Table 7 & Figure 24). It will be important to monitor this species in future surveys. This species is relatively easy to control in the short term, but due to the presence of large seed banks will be virtually impossible to eradicate or even achieve multiple year reductions.

Several native species also increased in abundance this season. Species like slender naiad, sago pondweed, leafy pondweed, and horned pondweed were not detected in 2007, but were present in the 2008 survey (Table 7 & Figure 24). In addition, American elodea was detected for the first time since Tier II surveys began on Griffy Lake. Common coontail, which was the most frequently occurring species prior to the fluridone treatments, has not been collected since April of 2007, however, a few fragments were observed during the August Tier II survey. This plant is very abundant in Indiana and

likely abundant in the watershed. It is likely that this plant will return to pretreatment levels within the next few years.

Table 7. Percent occurrence of species in Griffy Lake in the last nine Tier II surveys.

Species	July, 2004	Aug, 2004	July, 2005	Aug, 2006	April, 2007	Aug, 2007	May, 2008	July, 2008	Aug, 2008
Brazillian elodea	37.8%	32.3%	49.3%	10.0%	2.4%				
Eurasian watermilfoil	56.8%	54.8%	69.9%					2.0%	1.0%
curlyleaf pondweed	10.8%	3.2%	16.4%		23.5%		23.0%		
common coontail	91.9%	80.6%	72.6%	38.0%	1.2%				
Chara	8.1%	3.2%	2.7%	10.0%	14.1%	28.0%	17.0%	15.0%	10.0%
Slender naiad	5.4%	3.2%	15.1%						10.0%
sago pondweed	10.8%	8.1%	8.2%		3.5%			3.0%	9.0%
small pondweed	2.7%	1.6%	8.2%						
American elodea								1.0%	
leafy pondweed								5.0%	10.0%
American pondweed	5.4%	1.6%	2.7%						
horned pondweed	5.4%			2.0%			4.0%	3.0%	1.0%
brittle naiad	8.1%	21.0%	17.8%					10.0%	54.0%
water stargrass					1.2%				

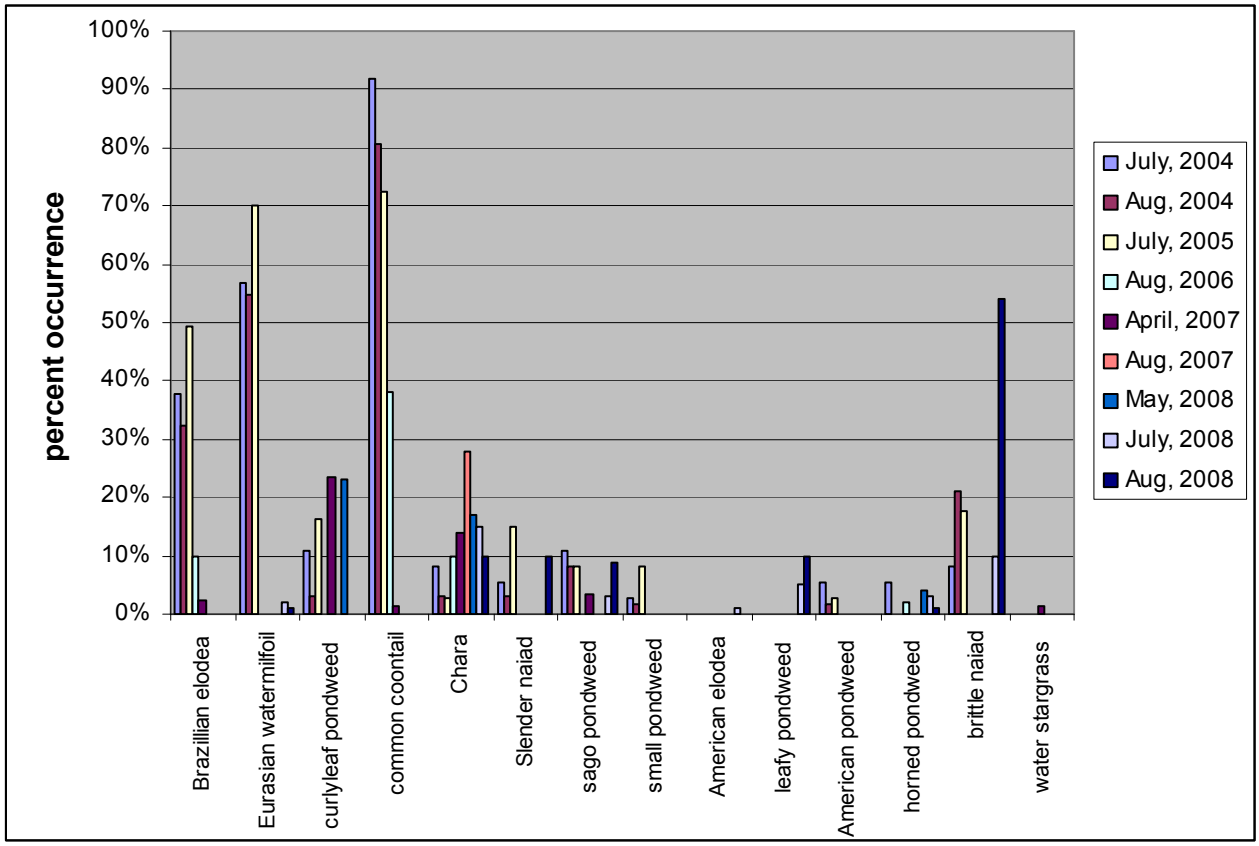

Figure 24. Percent occurrence of species in Griffy Lake in the last nine Tier II surveys (data from Table 7).

From the outset of the Brazilian elodea eradication project it was clear that there would be damage to the native plant population due to the need to use high rates of fluridone over extended periods of time. As previously discussed, there were several individual species that were not detected in 2007 but were detected in the 2008 sampling. A comparison of the plant community metrics illustrates this trend of increased diversity and abundance of native vegetation (Table 8 and Figure 25). However, Griffy Lake does not yet contain as diverse and abundant native plant population as it had prior to the whole lake treatments. It is likely that the lake will recover to pretreatment levels of native vegetation in the next one to two seasons.

Table 8. Comparison of plant community metrics in the last nine Tier II surveys.

Survey Date	Number of Sample Sites	Max Plant Depth	Secchi	% Sites With Vegetation	Number of Native Species	Native Species/Site	Native Diversity Index
July.04	40	18	7.8	94%	7	1.44	0.55
Aug.04	62	20	10.0	94%	6	1.52	0.57
July.05	72	18	7.5	87%	6	1.32	0.64
Aug.06	50	18	5.5	44%	3	0.5	0.43
April.07	82	9.5	5.0	41%	4	0.22	0.57
Aug.07	100	13	10.0	28%	1	0.28	0.00
May.08	100	12	9.0	39%	2	0.44	0.31
July.08	100	15	10.0	27%	5	0.27	0.73
Aug.08	100	15	12.0	58%	5	0.4	0.63

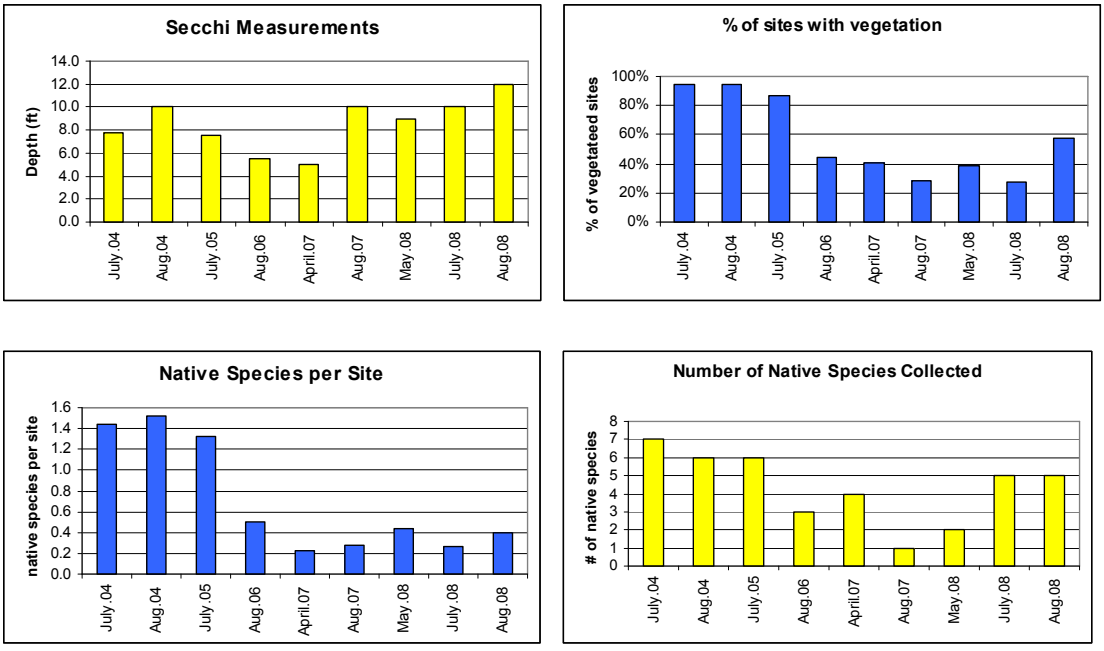

Figure 25. Comparison of Secchi measurements, % of sites with vegetation, number of species per site, and number of native species collected in the last nine surveys (Data from Table 8).

One of the main concerns prior to the fluridone treatment was that once the plants were removed, Griffy Lake would become turbid due to an increase in nutrient levels. This did not occur. Secchi measurements taken since 2004 are graphically illustrated above in Figure 25. Secchi measurements can be highly variable due to many environmental factors, but it appears that there was not a negative trend in water clarity following the treatments.

7.0 2008 VEGETATION CONTROL

There were no treatments completed for Brazilian eldoea control in 2008 since this species was not detected. However, treatments were completed on the invasive species curlyleaf pondweed and Eurasian watermilfoil.

Invasive species mapping was completed on April 9 primarily as a way to accurately mark all areas of curlyleaf pondweed prior to treatment. A total of 15.7 acres of curlyleaf pondweed was treated on April 17 with 1.0 ppm of Aquathol K herbicide (Figure 26). A Tier II survey was completed two weeks following application. Curlyleaf was still detectable in the treated areas, but plants were brown and appeared to be dying. Later inspections of the treated areas revealed that curlyleaf pondweed was controlled. Curlyleaf pondweed was only treated in areas where it was found during the April 9 sampling. Some new areas of curlyleaf pondweed developed outside of the treatment areas and should be controlled next season. These new areas were primarily in the coves along the north side of the lake and total just over 3.0 acres (Figure 27). Sampling should be completed again next spring prior to treatment in order to confirm treatment areas. In order to exhaust the curlyleaf pondweed turion supply it is likely that two more seasons of treatment will be needed.

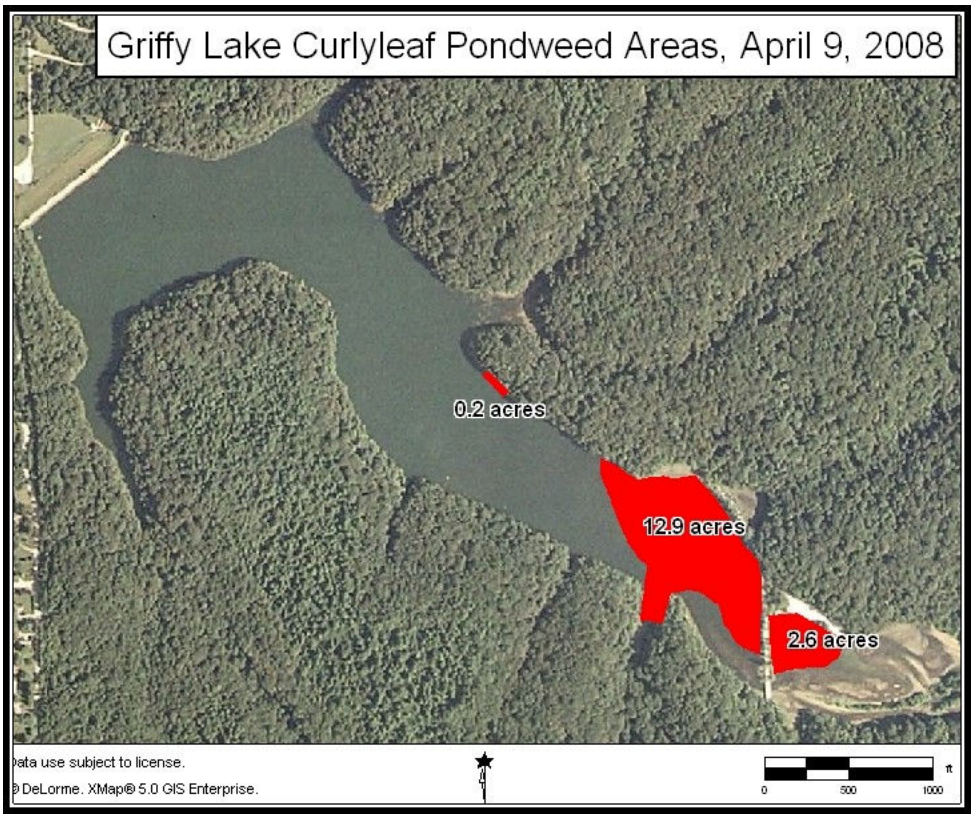

Figure 26. Griffy Lake curlyleaf pondweed treatment areas, April 17, 2008.

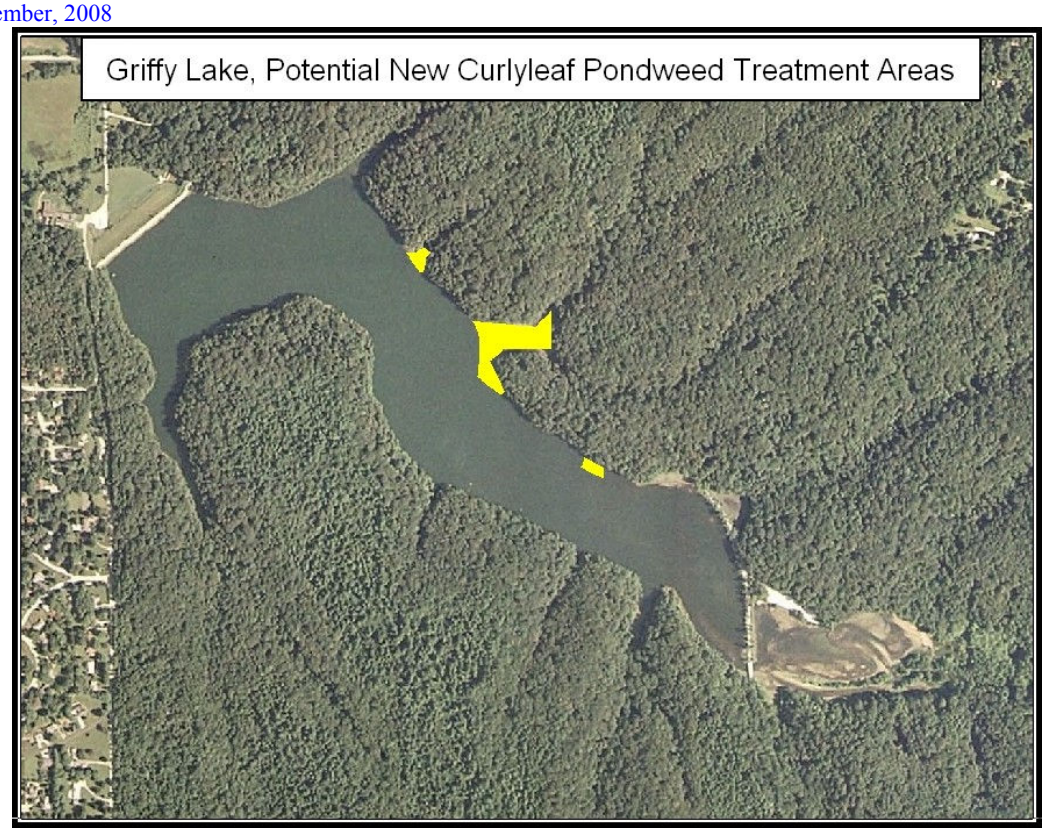

Figure 27. Griffy Lake, potential new curlyleaf pondweed treatment areas.

Eurasian watermilfoil detected during the July Tier II survey. A small scattered patch was growing in the shallow area just north of the boat ramp (Figure 28 & 29). This 2.95 acre area was treated on July 22nd with Renovate herbicide at a concentration of 1.5 ppm. Due to the shallow nature of the area, an airboat was used in the application. The treatment effectively controlled milfoil in that area.

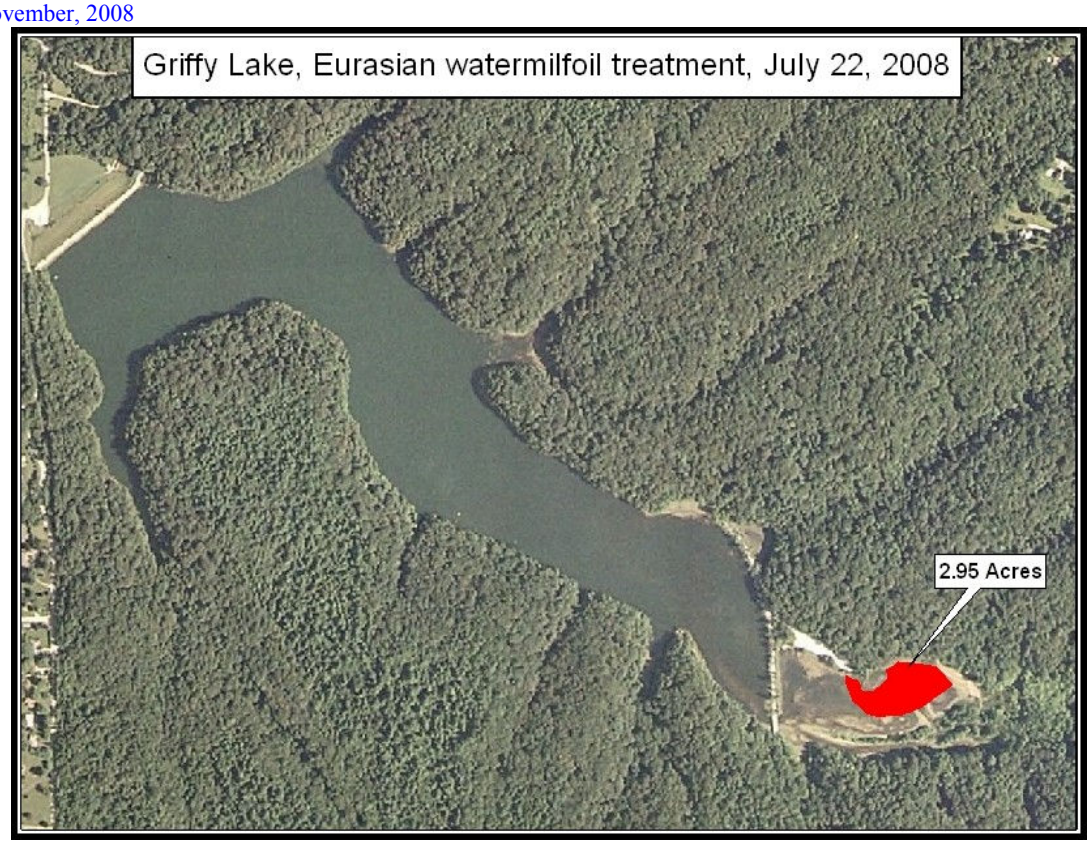

Figure 28. Griffy Lake, Eurasian watermilfoil treatment area, July 22, 2008.

Figure 29. Photograph of scattered Eurasian watermilfoil plants in treatment area, July 8, 2008.

It will be important to continue to monitor and control Eurasian watermilfoil in order to keep it from reaching pre-fluridone treatment levels. One of the main problems is that it appears that this plant is somewhere in the watershed (milfoil was found in an inflow creek and treated in 2007 leading one to believe that it is present upstream from Griffy Lake). Tameron Lake was the expected source of milfoil, but it was checked by Park personnel and none was found. It would benefit the parks department to check as many ponds as possible and work with the owners in an effort to reduce the amount of milfoil entering through the watershed. It may also be beneficial to walk the stream leading into Griffy Lake as it may be present is some of the pools.

8.0 AQUATIC PLANT MANAGEMENT ALTERNATIVES

Current vegetation management controls appear to be achieving the primary goal of eliminating Brazilian elodea and are controlling invasive species like Eurasian watermilfoil and curlyleaf pondweed while allowing native vegetation to return. Chemical control has been the primary action used to reach these goals. However, it is important to stay abreast of other control options. Sections 8.1-8.7 discuss the various options available for aquatic vegetation control in Griffy Lake.

8.1 No Action

Very little vegetation management was undertaken in Griffy Lake prior to 2006. This lack of action allowed invasive species to spread and dominate the Griffy Lake plant community (invasive species ranked 2nd, 3rd, 4th, and 6th in percent occurrence in the 2004 Tier II survey). In 2006 and 2007 IDNR spent nearly $150,000 in an effort to eradicate Brazilian elodea from Griffy Lake. In addition, the Parks department used LARE funds to manage areas of curlyleaf pondweed and Eurasian watermilfoil in 2008. These actions have led to reductions in invasive species abundance and we are now seeing a resurgence of native vegetation. If these actions were not taken it is likely that Brazilian elodea would continue to spread in Griffy Lake and possibly to other lakes in the areas. In addition it is likely that Eurasian watermilfoil and curlyleaf pondweed would return to pre-fluridone treatment levels within 2-3 years. Historical plant abundance data should lead one to the conclusion that no action is an option that should be avoided.

8.2 Institutional-Protection of Beneficial Vegetation and Preventing Introduction of Invasive Species

Presence of beneficial vegetation can inhibit the growth of species which may be more prone to create nuisance conditions. Protection of beneficial vegetation should be part of any vegetation management plan. Unfortunately, due to the need to control Brazilian elodea with high rates of Sonar (active ingredient: fluridone), very little native submersed vegetation remained in Griffy Lake at the end of the 2007 season. Many of the pondweed species have returned but were at lower levels in 2008 when compared to pre-fluridone treatment data. These species should be protected so that they can colonize areas that were once dominated by invasive species.

It is vitally important that invasive species are not allowed to return to Griffy Lake. The public boat launch area is the most likely area for reintroduction to occur. It is recommended that the Parks Department institutes inspections on all boats entering or leaving Griffy Lake. This should help prevent the return of invasive species. In addition,

there appears to be a source of Eurasian watermilfoil upstream of Griffy Lake. It is recommended that Parks personnel continue to check the watershed in an effort to find the source of Eurasian watermilfoil.

8.3 Environmental Manipulation

8.3.1 Water Level Manipulation

Water level manipulation refers to the raising of water levels to control aquatic vegetation by drowning or lowering to control aquatic vegetation by exposing them to freezing, drying or heat. The water level at Griffy Lake will be lowered during the winter of 2008-2009 in order to complete dam repairs (personal communication with Steve Cotter). This action will likely leave large areas of the littoral zone exposed to potential freezing and thawing and may aid in the control of curlyleaf pondweed and Eurasian watermilfoil. However, it is difficult to predict how effective this will be since one cannot predict the severity of winter or the longevity of the drawdown.

8.3.2 Nutrient Reduction

Plant growth can be limited if at least one nutrient, which is critical for growth, is in short supply. Nitrogen, phosphorus or carbon are usually the nutrients limiting plant growth in lakes. Therefore, if at least one of these nutrients can be limited sufficiently so that plants do not grow to a nuisance level, this nutrient limitation can be used as a method of aquatic plant management. Generally, plants in Indiana can obtain the majority of necessary nutrients from the soil. However, in certain situations, nutrient reduction can be effective at controlling overabundant floating vegetation or microscopic algae blooms since they obtain nutrients from the water column. It appears that Griffy Lake has relatively low nutrient levels and continued watershed improvements should preserve the lake for future generations.

8.4 Mechanical Control-Harvesting, Cutting, Dredging

Mechanical control includes cutting and/or harvesting of aquatic vegetation or dredging the bottom sediments to eliminate aquatic plant growth. The main advantage to mechanical control is the immediate removal of the plant growth from control areas and the removal of organic matter and nutrients.

One of the most common mechanical control techniques used on larger lakes in Indiana is mechanical harvesting. Mechanical harvesting uses machines which cut plant stems and, in most cases, pick up the cut fragments for disposal. This type of mechanical control has little selectivity. Where a mix of Eurasian watermilfoil and native species exists, harvesting favors the plant species that grow back most rapidly following harvesting. In most cases, Eurasian watermilfoil recovers from harvesting much more rapidly than native plants. Thus, repeated harvesting hastens the replacement of native species by Eurasian watermilfoil and often leads to dense monocultures of Eurasian watermilfoil in frequently harvested areas. Harvesting also stirs up bottom sediments thus reducing water clarity, kills fish and many invertebrates, and hastens the spread of Eurasian watermilfoil via fragmentation.

Dredging of shallow areas may reduce nuisance conditions caused by vegetation in the short-term, but studies and personal experience have shown that Eurasian watermilfoil is often the first species to colonize these disturbed areas. Dredging is expensive, especially if a nearby disposal sight is not available. Careful consideration to secondary environmental effects must be considered and permits from regulatory agencies are usually necessary before conducting dredging operations. There is the potential for dredging this winter while the lake is lowered. This would aid in navigation through the shallow areas east of the causeway and may also reduce the potential for invasive species like brittle naiad from reaching nuisance levels (brittle naiad grows in shallow water areas and making these areas deeper may prevent brittle naiad from reaching the surface and interfering with navigation).

8.5 Manual Control-Hand Pulling, Cutting, Raking

Removal of small amounts of vegetation by hand, which interfere with high use areas, may be the only vegetation control necessary in some areas. Of course, hand removal is labor intensive and must be conducted on a routine basis. The frequency and practicality of continued hand removal will depend on availability of labor, regrowth or reintroduction potential of the vegetation, and the level of control desired (Hoyer & Canfield, 1997). A 625 square foot area can be harvested without obtaining a permit from IDNR.

8.6 Biological Controls

Biological controls reduce aquatic vegetation using other organisms that consume aquatic plants or cause them to become diseased. The main biological controls for nuisance vegetation used in Indiana are the grass carp, milfoil weevil, and a variety of insects which prey upon purple loosestrife. Any use of biological controls or stocking fish in public waters in Indiana requires a permit from the IDNR Division of Fish and Wildlife.

8.6.1 Grass Carp

The grass carp (*Ctenopharyngodon idella)* is an herbivorous fish imported from Asia. Triploid grass carp, the sterile genetic derivative of the diploid grass carp, are legal for use in Indiana, but are not permitted for stocking in any natural lakes in the state. Grass carp tend to produce all or nothing aquatic plant control. It is very difficult to achieve a stocking rate sufficient to selectively control nuisance species without eliminating all submersed vegetation. They are not particularly appropriate for Eurasian watermilfoil control because this species is low on their feeding preference list; thus, they eat most native plants before consuming Eurasian watermilfoil (Smith, 2002). However, grass carp can be effective at controlling Brazilian elodea. Grass carp are difficult to remove from a lake once they have been stocked. Due to the legal concerns, all or nothing control, the difficulty in removing grass carp once stocked, and ineffectiveness of the grass carp to correct many vegetation problems, grass carp are not recommended for nuisance vegetation control in Griffy Lake.

8.6.2 Milfoil Weevil

The milfoil weevil, *Euhrychiopsis lecontei,* is a native North American insect that consumes Eurasian and Northern watermilfoil. The weevil was discovered following a natural decline of Eurasian watermilfoil in Brownington Pond, Vermont (Creed and Sheldon, 1993), and has apparently caused declines in several other water bodies. Weevil larvae burrow in the stem of Eurasian watermilfoil and consume the vascular tissue thus interrupting the flow of sugars and other materials between the upper and lower parts of the plant. Holes where the larvae burrow into and out of the stem allow disease organisms a foothold in the plants and allow gases to escape from the stem, causing the plants to lose buoyancy and sink (Creed et al. 1992).

Concerns about the use of the weevil as a biological control agent relate to whether introductions of the milfoil weevil will reliably produce reductions in Eurasian watermilfoil and whether the resulting reductions will be sufficient to satisfy users of the lake (Smith, 2002). Following our research, no conclusive data concerning the role of weevils in reducing Eurasian watermilfoil populations has been made available. In 2003, Scribailo and Alix conducted a weevil release on Griffy Lake and had no conclusive evidence supporting the use of weevils in reducing milfoil populations. Weevils may reduce milfoil populations in some lakes, but predicting which lakes and how much, if any, control will be achieved has not been documented (Scribailo & Alix 2003).

8.7 Chemical Control

Chemical control uses chemical herbicides to reduce or eliminate aquatic plant growth. The main perceived disadvantage to the use of herbicides is the publics concern over safety. Extensive testing is required of aquatic herbicides to ensure that the herbicides are low in toxicity to human and animal life and they are not overly persistent or bioaccumulated in fish or other organisms. It often takes several decades of testing by the Environmental Protection Agency (E.P.A.) before an herbicide is approved for aquatic use. After E.P.A. approval and registration, the herbicide must go through the registration process in each state. In addition, commercial aquatic applicators must obtain a license to apply aquatic herbicides in the state of Indiana.

Most aquatic herbicides have water use restrictions following their use. These restrictions must be posted prior to treatment on a public body of water. Aquatic herbicides typically have a 0-1 day swimming restriction, 0-30 day irrigation restrictions, and 0-21 day drinking water restrictions.

Another potential drawback to herbicide use is the potential release of nutrients that can occur if large areas of vegetation are controlled. This can be avoided by early application that controls vegetation before it reaches its maximum biomass. These perceived disadvantages are often times out-weighed by this technique's documented rapid effectiveness and selectivity.

There are two different types of aquatic herbicides, systemic and contact. Systemic herbicides are translocated throughout the plants and thereby kill the entire plants. Fluridone (trade name Sonar & Avast!), 2,4-D (trade name Navigate, Aqua-Kleen, & DMA4 IVM), and triclopyr (trade name Renovate) are systemic herbicides that can

effectively control Eurasian watermilfoil. Triclopyr, imazypry, and glyphosate are systemic herbicides that can control purple loosestrife.

Whole lake fluridone treatments have successfully controlled Brazilian elodea and Eurisan watermilfoil in Griffy Lake. When treating for control of Eurasian watermilfoil, an advantage to using fluridone over most contact herbicides is its selectivity. Most strains of Eurasian watermilfoil have a lower tolerance to fluridone than the majority of native species, so if the proper rates are applied Eurasian water milfoil can be controlled with little harm to the majority of native species. Unfortunately, when treating for control of Brazilian elodea, higher rates of fluridone are required thus limiting the selectivity of this herbicide.

Triclopyr is a systemic herbicide that has recently been approved for use in aquatics. Triclopyr typically is used for treating isolated Eurasian watermilfoil beds as opposed to whole lake treatments. This herbicide is very selective to Eurasian watermilfoil, and has no effect on Brazilian elodea or curlyleaf pondweed. A study was conducted in 1997 during the registration process of this herbicide. The study found Eurasian watermilfoil biomass was reduced by 99% in treated areas at 4 weeks post-treatment, remained low one year later, and was still at acceptable levels of control at two years post-treatment. Non-target native plant biomass increased 500-1000% by one year post-treatment, and remained significantly higher in the cove plot at two years post-treatment. Native species diversity doubled following herbicide treatment, and the restoration of the community delayed the re-establishment and dominance of Eurasian watermilfoil for three growing seasons (Getsinger et. al., 1997). Triclopyr is a good alternative to fluridone when Eurasian watermilfoil is not abundant throughout an entire water body. The primary water-use restriction following a triclopyr treatment is irrigation. An assay is needed to monitor the concentration in the water before irrigation can take place. One of the drawbacks to using triclopyr has been the fact that only a liquid formulation has been available. This can dramatically increase costs for treatment in deep water areas. In 2007, a granular formulation called Renovate OTF was approved for aquatic use in Indiana. Triclopyr would be a good tool for use on isolated patches of Eurasian watermilfoil if or when this species returns to Griffy Lake.

Applied properly, 2,4-D can also yield major reductions in the abundance of Eurasian watermilfoil. Much like triclopyr, treatments must be even and dose rates accurate. This formulation should be used much like triclopyr. Unlike triclopyr, 2,4-D can impact the native species coontail. This herbicide can be applied for less cost than triclopyr, but damage will likely occur to coontail. 2,4-D herbicide should be considered as an alternative to triclopyr applications if there are severe budget restrictions. 2,4-D is also available in liquid and granular formulations.

Contact herbicides can also be effective for controlling submersed vegetation in the short term. The three primary contact herbicides used for control of submersed vegetation are diquat (trade name Reward), endothal (trade name Aquathol), and copper based formulations (trade names Komeen, Nautique, and Clearigate).

Historically, a drawback to the use of contact herbicides has been the lack of selectivity exhibited by these herbicides. However, a study completed by Skogerboe and Getsinger

in 2002 outlines how endothal can be used for control of the exotic species curlyleaf pondweed and Eurasian watermilfoil with little effect on the majority of native species. They found early season treatments with endothall effectively controlled Eurasian watermilfoil and curlyleaf pondweed at several application rates with no regrowth eight weeks after treatment. Sago pondweed, eel grass, and Illinois pondweed biomass were also significantly reduced following the endothall application, but regrowth was observed at eight weeks post-treatment. Coontail and elodea showed no effects from endothall at three of the lower application rates. Spatterdock, pickerelweed, cattail, and smartweed were not injured at any of the application rates (Skogerboe & Getsinger 2002). This type of treatment strategy could be applied to lakes that have large areas of both curlyleaf pondweed and Eurasian watermilfoil. Endothal could also be effective the year after whole lake sonar treatments where curlyleaf pondweed typically returns the following season. Several years of application may be required to exhaust the curlyleaf pondweed turion supply.

Diquat and many of the copper formulations are effective fast acting contact herbicides. These formulations are typically used when control of all submersed vegetation is desired. These herbicides are commonly used for control of nuisance vegetation around docks and near-shore high-use areas. Diquat and the copper based herbicides are not as selective as many of the other herbicides and plants can often time recover in 4-8 weeks after treatment. There are no water use restrictions following the use of chelated copper based herbicide, which makes them popular choices for lakes used for irrigation or drinking water.

9.0 PUBLIC EDUCATION & INVOLVEMENT

The prevention of reintroduction of invasive exotic species is one of the most important actions that should be taken concerning aquatic plant management in Griffy Lake. The primary public access to Griffy Lake is at the public boat launch area. This area should contain easy to read and understand signage about the need to thoroughly clean boats and trailers prior to launch. If possible, it would also be beneficial to have all boats and trailers visually inspected by the attendant prior to launch. These actions should reduce the chances of reintroduction of invasive species into Griffy Lake. A summary of vegetation management activities and future plans was presented to the public at a Bloomington Parks Board meeting on November 18, 2008.

10.0 ACTION PLAN AND BUDGET UPDATE

The primary goal of the vegetation management plan is the eradication of Brazilian elodea. Whole lake fluridone treatments in 2007 and 2008 appear to have successfully controlled this plant to the point that it was not detectable. Even though Brazilian elodea has not been detected since the spring of 2007, this does not imply that it is officially eradicated. Future plant management should continue to focus on detection of any remaining Brazilian elodea. This should include Tier II surveys in early May, early July, and early September of 2009. Each survey should include a minimum of 100 rake tosses in the same areas as 2007 and 2008. The estimated cost of completing three surveys with 100 points along with plan update is $8,700. If any Brazilian elodea is detected it should be immediately dealt with in order to prevent spread. If detected in rake sampling, a 5-

acre area surrounding the detection site should be treated with 150 ppb of Sonar PR. This area should be sampled again 12 weeks after treatment with a minimum of 20 rake tosses along with a visual inspection. If needed, the estimated cost of this type of treatment is $10,000. It is highly unlikely, but if Brazilian elodea is detected during the spring sampling in multiple areas or in locations greater than 1-acre, then another whole lake treatment should be initiated immediately. The estimated cost of another whole lake fluridone treatment is $68,000. Due to the importance placed on the eradication of Brazilian elodea, it is recommended that IDNR budget for these actions.

Eurasian watermilfoil and curlyleaf pondweed are two other invasive species that have reached nuisance levels in Griffy Lake. Treatments in 2008 kept these species from returning to pre-fluridone treatment levels. An invasive species mapping survey should be completed in early April of 2009 in order to map out potential treatment areas. Tier II sampling should be adequate to detect any areas of Eurasian watermilfoil during the spring and summer growing season. Areas of milfoil should be quickly treated with Renovate herbicide. The typical cost treating milfoil with Renovate OTF is roughly $500-$600/acre. The estimated cost of controlling milfoil in 2009 is $2,000.00.

Early season treatment of curlyleaf pondweed should be completed again in 2009. Treatment may be needed for two more seasons in order to exhaust turion supplies. Up to 18 acres of curlyleaf may require treatment in 2009. The estimated cost of this treatment would be $5,000. The curlyleaf pondweed and potential Eurasian watermilfoil treatments would once again require funding from LARE and the City of Bloomington Parks Department.

Brittle naiad became abundant during the late summer of 2008. This species is considered invasive and managed as such in many states. However, the author is not aware of any statewide efforts to fund management of this species since it is rarely a problem. Brittle naiad should be monitored with the Tier II surveys and steps may need to be taken in order to alleviate potential nuisance conditions caused by this species.

Plans are in place to reduce the water level of Griffy Lake in order to complete dam repairs. This may have an impact on both native and invasive species if there is adequate lowering along with sufficient freezing and thawing this winter. The impact of the drawdown will be assessed with the early spring invasive species mapping and frequent Tier II surveys.

It appears that native vegetation is returning to Griffy Lake without the help of plant managers. There is no need for any planting of native vegetation at this time.

Table 9 illustrates a predicted budget for plant management action on Griffy Lake for the next four years.

Table 9. Predicted budget for Griffy Lake plant management action plan.

Action	Potential Funding Source	2009	2010	2011	2012
Point Sampling and Plan Update	IDNR	$8,700.00	$8,700.00		
Milfoil Spot Treatments	Parks/LARE	$2,000.00	$2,000.00	$2,000.00	$2,000.00
Early Season Curlyleaf Treatments	Parks/LARE	$5,000.00	$5,000.00		
Invasive Species Mapping (Early Spring)	Parks/LARE	$500.00	$500.00	$500.00	$500.00

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12.0 APPENDIX UPDATE

12.1 2008 Sampling Data

Lake	Date	Latitude	Longitude	Site	Depth	RAKE	POCR3	CH?AR	ZAPA
Griffy	5.5.08	39.197931	-86.513026	1	6.0	1	1		
Griffy	5.5.08	39.197674	-86.512445	2	5.0	3	3		
Griffy	5.5.08	39.197448	-86.511822	3	3.0	1			1
Griffy	5.5.08	39.197384	-86.510825	4	1.0	0			
Griffy	5.5.08	39.197481	-86.512957	5	5.0	1	1		
Griffy	5.5.08	39.197094	-86.512168	6	4.0	1			1
Griffy	5.5.08	39.197009	-86.51142	7	3.0	0			
Griffy	5.5.08	39.196998	-86.512846	8	3.0	1			1
Griffy	5.5.08	39.197234	-86.513816	9	2.0	5		5	
Griffy	5.5.08	39.197685	-86.514397	10	3.0	5		5	1
Griffy	5.5.08	39.198285	-86.514826	11	5.0	1	1		
Griffy	5.5.08	39.198285	-86.515615	12	8.0	3	3		
Griffy	5.5.08	39.197888	-86.515837	13	3.0	0			
Griffy	5.5.08	39.199006	-86.515855	14	9.0	0			
Griffy	5.5.08	39.198983	-86.515242	15	8.0	3	3		
Griffy	5.5.08	39.198843	-86.514563	16	7.0	5	5	1	
Griffy	5.5.08	39.198425	-86.513968	17	8.0	1	1		
Griffy	5.5.08	39.197942	-86.513746	18	7.0	1		1	
Griffy	5.5.08	39.199159	-86.51434	19	8.0	5	5		
Griffy	5.5.08	39.199584	-86.514549	20	8.0	5	5		
Griffy	5.5.08	39.199573	-86.515145	21	8.0	3	3		
Griffy	5.5.08	39.200099	-86.514771	22	8.0	3	3		
Griffy	5.5.08	39.200045	-86.515338	23	8.0	3	3		
Griffy	5.5.08	39.199862	-86.515809	24	7.0	3	3		
Griffy	5.5.08	39.1996	-86.516325	25	10.0	3	3		
Griffy	5.5.08	39.200191	-86.516523	26	11.0	3	3		
Griffy	5.5.08	39.200549	-86.51711	27	12.0	1	1		
Griffy	5.5.08	39.200878	-86.517545	28	14.0	0			
Griffy	5.5.08	39.201171	-86.518163	29	15.0	0			
Griffy	5.5.08	39.201464	-86.518813	30	16.0	0			
Griffy	5.5.08	39.201837	-86.519229	31	15.0	0			
Griffy	5.5.08	39.202218	-86.519549	32	11.0	1	1		
Griffy	5.5.08	39.202673	-86.519298	33	7.0	1	1	1	
Griffy	5.5.08	39.202759	-86.518782	34	5.0	0			
Griffy	5.5.08	39.202888	-86.518301	35	4.0	5	1	5	
Griffy	5.5.08	39.203185	-86.518164	36	2.0	5		5	
Griffy	5.5.08	39.203092	-86.518703	37	5.0	1		1	
Griffy	5.5.08	39.203189	-86.51918	38	9.0	1	1		
Griffy	5.5.08	39.203253	-86.519866	39	14.0	0			
Griffy	5.5.08	39.203714	-86.520538	40	16.0	0			
Griffy	5.5.08	39.2041	-86.521056	41	12.0	0			
Griffy	5.5.08	39.204414	-86.521167	42	12.0	1	1		
Griffy	5.5.08	39.205085	-86.521964	43	9.0	0			
Griffy	5.5.08	39.205474	-86.522413	44	9.0	0			
Griffy	5.5.08	39.205829	-86.522645	45	12.0	0			
Griffy	5.5.08	39.206309	-86.522309	46	5.0	0			
Griffy	5.5.08	39.206128	-86.522828	47	9.0	0			
Griffy	5.5.08	39.205819	-86.523574	48	7.0	1		1	
Griffy	5.5.08	39.205592	-86.524033	49	7.0	0			
Griffy	5.5.08	39.205455	-86.524627	50	10.0	1		1	
Griffy	5.5.08	39.205441	-86.525362	51	7.0	1		1	
Griffy	5.5.08	39.205508	-86.525899	52	6.0	1	1	1	
Griffy	5.5.08	39.20556	-86.526656	53	15.0	0			
Griffy	5.5.08	39.205441	-86.526858	54	8.0	0			
Griffy	5.5.08	39.205225	-86.527157	55	7.0	1		1	
Griffy	5.5.08	39.205055	-86.527481	56	2.0	0			
Griffy	5.5.08	39.204718	-86.527915	57	6.0	0			
Griffy	5.5.08	39.204615	-86.528187	58	5.0	0			
Griffy	5.5.08	39.204305	-86.528654	59	7.0	0			
Griffy	5.5.08	39.203929	-86.52845	60	7.0	0			
Griffy	5.5.08	39.203443	-86.528263	61	7.0	0			
Griffy	5.5.08	39.203081	-86.528035	62	11.0	0			
Griffy	5.5.08	39.202694	-86.527493	63	10.0	0			
Griffy	5.5.08	39.202427	-86.527425	64	10.0	0			
Griffy	5.5.08	39.20207	-86.527595	65	10.0	1		1	
Griffy	5.5.08	39.201611	-86.527605	66	8.0	0			
Griffy	5.5.08	39.201092	-86.527387	67	5.0	0			
Griffy	5.5.08	39.200785	-86.527052	68	8.0	0			
Griffy	5.5.08	39.200522	-86.526663	69	4.0	0			
Griffy	5.5.08	39.201567	-86.52707	70	15.0	0			
Griffy	5.5.08	39.202083	-86.52683	71	14.0	0			
Griffy	5.5.08	39.202566	-86.526828	72	20.0	0			
Griffy	5.5.08	39.202942	-86.526567	73	6.0	0			
Griffy	5.5.08	39.203125	-86.526318	74	15.0	0			
Griffy	5.5.08	39.203264	-86.525875	75	10.0	1		1	
Griffy	5.5.08	39.203411	-86.525412	76	10.0	0			
Griffy	5.5.08	39.203411	-86.525412	77	10.0	0			
Griffy	5.5.08	39.203596	-86.52474	78	7.0	1		1	
Griffy	5.5.08	39.203767	-86.524187	79	8.0	0			
Griffy	5.5.08	39.203736	-86.523701	80	5.0	0			
Griffy	5.5.08	39.203585	-86.523263	81	5.0	0			
Griffy	5.5.08	39.203457	-86.522926	82	8.0	0			
Griffy	5.5.08	39.203251	-86.522479	83	7.0	0			
Griffy	5.5.08	39.203006	-86.522289	84	10.0	0			
Griffy	5.5.08	39.202603	-86.522241	85	18.0	0			
Griffy	5.5.08	39.202019	-86.522344	86	16.0	0			
Griffy	5.5.08	39.201135	-86.521939	87	10.0	0			
Griffy	5.5.08	39.200689	-86.521403	88	6.0	0			
Griffy	5.5.08	39.200437	-86.520714	89	16.0	0			
Griffy	5.5.08	39.200131	-86.520711	90	4.0	1		1	
Griffy	5.5.08	39.200036	-86.519881	91	8.0	0			
Griffy	5.5.08	39.199905	-86.519312	92	9.0	0			
Griffy	5.5.08	39.199712	-86.518735	93	5.0	0			
Griffy	5.5.08	39.199541	-86.518412	94	4.0	0			
Griffy	5.5.08	39.199415	-86.517907	95	5.0	0			
Griffy	5.5.08	39.199262	-86.517679	96	4.0	0			
Griffy	5.5.08	39.198875	-86.517293	97	1.0	0			
Griffy	5.5.08	39.198972	-86.516876	98	5.0	0			
Griffy	5.5.08	39.198868	-86.51648	99	10.0	0			
Griffy	5.5.08	39.198629	-86.516003	100	4.0	0			

Lake	Date	Latitude	Longitude	Site	Depth	RAKE	NAMI	MYSP2	POCR3	CH?AR	NAFL	POPE6	ELCA7	POFO3	ZAPA
Griffy	7/8/08	39.197931	-86.513026	1	4.0	0									
Griffy	7/8/08	39.197674	-86.512445	2	4.0	1						1			
Griffy	7/8/08	39.197448	-86.511822	3	2.0	0									
Griffy	7/8/08	39.197384	-86.510825	4	1.0	1				1					1
Griffy	7/8/08	39.197481	-86.512957	5	4.0	0									
Griffy	7/8/08	39.197094	-86.512168	6	3.0	1								1	
Griffy	7/8/08	39.197009	-86.51142	7	2.0	0									
Griffy	7/8/08	39.196998	-86.512846	8	3.0	5				5			1		1
Griffy	7/8/08	39.197234	-86.513816	9	3.0	1									1
Griffy	7/8/08	39.197685	-86.514397	10	4.0	3	1			3				1	
Griffy	7/8/08	39.198285	-86.514826	11	5.0	3	1							3	
Griffy	7/8/08	39.198285	-86.515615	12	7.0	1				1					
Griffy	7/8/08	39.197888	-86.515837	13	3.0	0									
Griffy	7/8/08	39.199006	-86.515855	14	9.0	1						1			
Griffy	7/8/08	39.198983	-86.515242	15	6.0	1				1					
Griffy	7/8/08	39.198843	-86.514563	16	7.0	0									
Griffy	7/8/08	39.198425	-86.513968	17	7.0	0									
Griffy	7/8/08	39.197942	-86.513746	18	7.0	0									
Griffy	7/8/08	39.199159	-86.51434	19	7.0	0									
Griffy	7/8/08	39.199584	-86.514549	20	7.0	0									
Griffy	7/8/08	39.199573	-86.515145	21	7.0	0									
Griffy	7/8/08	39.200099	-86.514771	22	5.0	3	1			1				1	
Griffy	7/8/08	39.200045	-86.515338	23	7.0	1	1			1					
Griffy	7/8/08	39.199862	-86.515809	24	8.0	0									
Griffy	7/8/08	39.1996	-86.516325	25	10.0	0									
Griffy	7/8/08	39.200191	-86.516523	26	10.0	0									
Griffy	7/8/08	39.200549	-86.51711	27	13.0	0									
Griffy	7/8/08	39.200878	-86.517545	28	14.0	0									
Griffy	7/8/08	39.201171	-86.518163	29	12.0	0									
Griffy	7/8/08	39.201464	-86.518813	30	13.0	0									
Griffy	7/8/08	39.201837	-86.519229	31	12.0	0									
Griffy	7/8/08	39.202218	-86.519549	32	13.0	0									
Griffy	7/8/08	39.202673	-86.519298	33	3.0	5				5					
Griffy	7/8/08	39.202759	-86.518782	34	2.0	0									
Griffy	7/8/08	39.202888	-86.518301	35	2.0	0									
Griffy	7/8/08	39.203185	-86.518164	36	1.0	0									
Griffy	7/8/08	39.203092	-86.518703	37	5.0	0									
Griffy	7/8/08	39.203189	-86.51918	38	9.0	1	1								
Griffy	7/8/08	39.203253	-86.519866	39	15.0	0									
Griffy	7/8/08	39.203714	-86.520538	40	16.0	0									
Griffy	7/8/08	39.2041	-86.521056	41	12.0	0									
Griffy	7/8/08	39.204414	-86.521167	42	8.0	5				5					
Griffy	7/8/08	39.205085	-86.521964	43	3.0	5				5					
Griffy	7/8/08	39.205474	-86.522413	44	11.0	0									
Griffy	7/8/08	39.205829	-86.522645	45	10.0	0									
Griffy	7/8/08	39.206309	-86.522309	46	5.0	1								1	
Griffy	7/8/08	39.206128	-86.522828	47	8.0	1				1					
Griffy	7/8/08	39.205819	-86.523574	48	10.0	0									
Griffy	7/8/08	39.205592	-86.524033	49	12.0	0									
Griffy	7/8/08	39.205455	-86.524627	50	14.0	0									
Griffy	7/8/08	39.205441	-86.525362	51	8.0	1	1			1					
Griffy	7/8/08	39.205508	-86.525899	52	15.0	0									
Griffy	7/8/08	39.20556	-86.526656	53	12.0	0									
Griffy	7/8/08	39.205441	-86.526858	54	4.0	3	1			1		1			
Griffy	7/8/08	39.205225	-86.527157	55	15.0	1		1							
Griffy	7/8/08	39.205055	-86.527481	56	8.0	0									
Griffy	7/8/08	39.204718	-86.527915	57	5.0	1				1					
Griffy	7/8/08	39.204615	-86.528187	58	4.0	0									
Griffy	7/8/08	39.204305	-86.528654	59	15.0	0									
Griffy	7/8/08	39.203929	-86.52845	60	20.0	0									
Griffy	7/8/08	39.203443	-86.528263	61	8.0	1	1								
Griffy	7/8/08	39.203081	-86.528035	62	10.0	0									
Griffy	7/8/08	39.202694	-86.527493	63	10.0	0									
Griffy	7/8/08	39.202427	-86.527425	64	14.0	0									
Griffy	7/8/08	39.20207	-86.527595	65	15.0	0									
Griffy	7/8/08	39.201611	-86.527605	66	7.0	0									
Griffy	7/8/08	39.201092	-86.527387	67	7.0	0									
Griffy	7/8/08	39.200785	-86.527052	68	6.0	0									
Griffy	7/8/08	39.200522	-86.526663	69	4.0	0									
Griffy	7/8/08	39.201567	-86.52707	70	16.0	0									
Griffy	7/8/08	39.202083	-86.52683	71	7.0	0									
Griffy	7/8/08	39.202566	-86.526828	72	18.0	0									
Griffy	7/8/08	39.202942	-86.526567	73	4.0	1				1					
Griffy	7/8/08	39.203125	-86.526318	74	18.0	0									
Griffy	7/8/08	39.203264	-86.525875	75	6.0	0									
Griffy	7/8/08	39.203411	-86.525412	76	5.0	1	1								
Griffy	7/8/08	39.203411	-86.525412	77	5.0	0									
Griffy	7/8/08	39.203596	-86.52474	78	8.0	0									
Griffy	7/8/08	39.203767	-86.524187	79	8.0	0									
Griffy	7/8/08	39.203736	-86.523701	80	12.0	0									
Griffy	7/8/08	39.203585	-86.523263	81	6.0	0									
Griffy	7/8/08	39.203457	-86.522926	82	8.0	0									
Griffy	7/8/08	39.203251	-86.522479	83	6.0	0									
Griffy	7/8/08	39.203006	-86.522289	84	12.0	0									
Griffy	7/8/08	39.202603	-86.522241	85	18.0	0									
Griffy	7/8/08	39.202019	-86.522344	86	6.0	0									
Griffy	7/8/08	39.201135	-86.521939	87	11.0	0									
Griffy	7/8/08	39.200689	-86.521403	88	10.0	0									
Griffy	7/8/08	39.200437	-86.520714	89	5.0	0									
Griffy	7/8/08	39.200131	-86.520711	90	6.0	0									
Griffy	7/8/08	39.200036	-86.519881	91	4.0	0									
Griffy	7/8/08	39.199905	-86.519312	92	2.0	1	1								
Griffy	7/8/08	39.199712	-86.518735	93	5.0	0									
Griffy	7/8/08	39.199541	-86.518412	94	7.0	0									
Griffy	7/8/08	39.199415	-86.517907	95	8.0	0									
Griffy	7/8/08	39.199262	-86.517679	96	5.0	0									
Griffy	7/8/08	39.198875	-86.517293	97	2.0	0									
Griffy	7/8/08	39.198972	-86.516876	98	5.0	0									
Griffy	7/8/08	39.198868	-86.51648	99	6.0	0									
Griffy	7/8/08	39.198629	-86.516003	100	6.0	1		1							

Lake	Date	Latitude	Longitude	Site	Depth	RAKE	NAMI	MYSP2	CH?AR	NAFL	POPE6	ELCA7	POFO3
Griify	8/26/08	39.197931	-86.513026	1	4.0	1	1				1		1
Griify	8/26/08	39.197674	-86.512445	2	3.0	1	1						1
Griify	8/26/08	39.197448	-86.511822	3	2.0	5	5		1	1			1
Griify	8/26/08	39.197384	-86.510825	4	1.0	3	3		1	1			
Griify	8/26/08	39.197481	-86.512957	5	4.0	1	1				1		1
Griify	8/26/08	39.197094	-86.512168	6	2.0	5	1			1	5		
Griify	8/26/08	39.197009	-86.51142	7	1.0	3	3						1
Griify	8/26/08	39.196998	-86.512846	8	2.0	5	3		3	1	5		
Griify	8/26/08	39.197234	-86.513816	9	2.0	5	5						
Griify	8/26/08	39.197685	-86.514397	10	2.0	5	5						
Griify	8/26/08	39.198285	-86.514826	11	4.0	5	5		1				
Griify	8/26/08	39.198285	-86.515615	12	7.0	3	3						1
Griify	8/26/08	39.197888	-86.515837	13	2.0	1	1						1
Griify	8/26/08	39.199006	-86.515855	14	9.0	1	1				1		
Griify	8/26/08	39.198983	-86.515242	15	8.0	1	1			1			
Griify	8/26/08	39.198843	-86.514563	16	7.0	5	5				1		
Griify	8/26/08	39.198425	-86.513968	17	6.0	3	3	1			1		1
Griify	8/26/08	39.197942	-86.513746	18	6.0	3	3						
Griify	8/26/08	39.199159	-86.51434	19	7.0	5	5						
Griify	8/26/08	39.199584	-86.514549	20	6.0	3	3			1			
Griify	8/26/08	39.199573	-86.515145	21	5.0	5	5						
Griify	8/26/08	39.200099	-86.514771	22	5.0	5	5						
Griify	8/26/08	39.200045	-86.515338	23	6.0	5	5						1
Griify	8/26/08	39.199862	-86.515809	24	7.0	3	3				1		
Griify	8/26/08	39.1996	-86.516325	25	9.0	3	3			1			1
Griify	8/26/08	39.200191	-86.516523	26	10.0	0							
Griify	8/26/08	39.200549	-86.51711	27	12.0	0							
Griify	8/26/08	39.200878	-86.517545	28	13.0	0							
Griify	8/26/08	39.201171	-86.518163	29	12.0	1				1			
Griify	8/26/08	39.201464	-86.518813	30	15.0	1			1				
Griify	8/26/08	39.201837	-86.519229	31	15.0	0							
Griify	8/26/08	39.202218	-86.519549	32	14.0	0							
Griify	8/26/08	39.202673	-86.519298	33	1.0	5	5						
Griify	8/26/08	39.202759	-86.518782	34	3.0	3	3						
Griify	8/26/08	39.202888	-86.518301	35	1.0	5	5						
Griify	8/26/08	39.203185	-86.518164	36	1.0	5	5						
Griify	8/26/08	39.203092	-86.518703	37	3.0	5	5						
Griify	8/26/08	39.203189	-86.51918	38	8.0	0							
Griify	8/26/08	39.203253	-86.519866	39	13.0	0							
Griify	8/26/08	39.203714	-86.520538	40	10.0	1	1						
Griify	8/26/08	39.2041	-86.521056	41	11.0	0							
Griify	8/26/08	39.204414	-86.521167	42	12.0	3	3				1		
Griify	8/26/08	39.205085	-86.521964	43	5.0	3	3		1				
Griify	8/26/08	39.205474	-86.522413	44	7.0	3	3						
Griify	8/26/08	39.205829	-86.522645	45	13.0	0							
Griify	8/26/08	39.206309	-86.522309	46	5.0	3	3						
Griify	8/26/08	39.206128	-86.522828	47	9.0	5	5						
Griify	8/26/08	39.205819	-86.523574	48	9.0	0							
Griify	8/26/08	39.205592	-86.524033	49	6.0	0							
Griify	8/26/08	39.205455	-86.524627	50	8.0	0							
Griify	8/26/08	39.205441	-86.525362	51	4.0	5	5		5				
Griify	8/26/08	39.205508	-86.525899	52	7.0	3	3						
Griify	8/26/08	39.20556	-86.526656	53	12.0	0							
Griify	8/26/08	39.205441	-86.526858	54	7.0	5	5						
Griify	8/26/08	39.205225	-86.527157	55	9.0	1	1						
Griify	8/26/08	39.205055	-86.527481	56	4.0	5	1		5				
Griify	8/26/08	39.204718	-86.527915	57	5.0	5	3		1				
Griify	8/26/08	39.204615	-86.528187	58	6.0	3	3						
Griify	8/26/08	39.204305	-86.528654	59	6.0	1				1			
Griify	8/26/08	39.203929	-86.52845	60	7.0	0							
Griify	8/26/08	39.203443	-86.528263	61	5.0	1	1						
Griify	8/26/08	39.203081	-86.528035	62	8.0	0							
Griify	8/26/08	39.202694	-86.527493	63	11.0	0							
Griify	8/26/08	39.202427	-86.527425	64	11.0	0							
Griify	8/26/08	39.20207	-86.527595	65	4.0	0							
Griify	8/26/08	39.201611	-86.527605	66	5.0	0							
Griify	8/26/08	39.201092	-86.527387	67	5.0	0							
Griify	8/26/08	39.200785	-86.527052	68	5.0	0							
Griify	8/26/08	39.200522	-86.526663	69	4.0	1	1						
Griify	8/26/08	39.201567	-86.52707	70	12.0	1	1						
Griify	8/26/08	39.202083	-86.52683	71	6.0	0							
Griify	8/26/08	39.202566	-86.526828	72	16.0	0							
Griify	8/26/08	39.202942	-86.526567	73	4.0	5	5						
Griify	8/26/08	39.203125	-86.526318	74	12.0	0							
Griify	8/26/08	39.203264	-86.525875	75	13.0	0							
Griify	8/26/08	39.203411	-86.525412	76	11.0	3	3						
Griify	8/26/08	39.203411	-86.525412	77	3.0	1	1		1				
Griify	8/26/08	39.203596	-86.52474	78	15.0	0							
Griify	8/26/08	39.203767	-86.524187	79	9.0	0							
Griify	8/26/08	39.203736	-86.523701	80	4.0	0							
Griify	8/26/08	39.203585	-86.523263	81	3.0	0							
Griify	8/26/08	39.203457	-86.522926	82	8.0	0							
Griify	8/26/08	39.203251	-86.522479	83	11.0	0							
Griify	8/26/08	39.203006	-86.522289	84	8.0	0							
Griify	8/26/08	39.202603	-86.522241	85	20.0	0							
Griify	8/26/08	39.202019	-86.522344	86	10.0	0							
Griify	8/26/08	39.201135	-86.521939	87	6.0	0							
Griify	8/26/08	39.200689	-86.521403	88	11.0	1	1						
Griify	8/26/08	39.200437	-86.520714	89	15.0	0							
Griify	8/26/08	39.200131	-86.520711	90	6.0	1	1						
Griify	8/26/08	39.200036	-86.519881	91	6.0	0							
Griify	8/26/08	39.199905	-86.519312	92	11.0	0							
Griify	8/26/08	39.199712	-86.518735	93	10.0	1	1						
Griify	8/26/08	39.199541	-86.518412	94	10.0	0							
Griify	8/26/08	39.199415	-86.517907	95	11.0	0							
Griify	8/26/08	39.199262	-86.517679	96	6.0	0							
Griify	8/26/08	39.198875	-86.517293	97	2.0	1	1						
Griify	8/26/08	39.198972	-86.516876	98	9.0	0							
Griify	8/26/08	39.198868	-86.51648	99	9.0	1				1			
Griify	8/26/08	39.198629	-86.516003	100	6.0	1	1						

12.2 2008 Permit Applications

APPLICATION FOR AQUATIC VEGETATION CONTROL PERMIT
State Form 26727 (R / 11-03)
Approved State Board of Accounts 1987
[ ] Whole Lake [x] Multiple Treatment Areas
Check type of permit

INSTRUCTIONS: Please print or type information

FOR OFFICE USE ONLY
License No.
Date Issued
Lake County

Return to: Page 1 of 3
DEPARTMENT OF NATURAL RESOURCES
Division of Fish and Wildlife
Commercial License Clerk
402 West Washington Street, Room W273
Indianapolis, IN 46204

FEE: $5.00

Applicant's Name	Lake Assoc. Name	
City of Bloomington Parks and Recreation		
Rural Route or Street: 401 N. Morton St. Suite 250		Phone Number: 812-349-3736
City and State: Bloomington, IN		ZIP Code: 47402
Certified Applicator (if applicable)	Company or Inc. Name	Certification Number
Rural Route or Street		Phone Number
City and State		ZIP Code

Lake (One application per lake)	Nearest Town	County
Griffy	Bloomington	Monroe
Does water flow into a water supply		[ ] Yes [x] No

Please complete one section for *EACH* treatment area. Attach lake map showing treatment area and denote location of any water supply intake.

Treatment Area # 1	LAT/LONG or UTM's: Will Map Prior to Treatment (See AVMP and 2008)		
Total acres to be controlled: <20	Proposed shoreline treatment length (ft): n.a.	Perpendicular distance from shoreline (ft): n.a.	
Maximum Depth of Treatment (ft): <15	Expected date(s) of treatment(s): early April or when water hits consistent 50 degrees		
Treatment method: [x] Chemical	[ ] Physical	[ ] Biological Control	[ ] Mechanical

Based on treatment method, describe chemical used, method of physical or mechanical control and disposal area, or the species and stocking rate for biological control. Aquathol K at 1.0 ppm for early season control of curlyleaf pondweed

Plant survey method: [x] Rake [ ] Visual [ ] Other (specify) Spring 2008 Tier II Survey

Aquatic Plant Name	Check if Target Species	Relative Abundance % of Community
Curlyleaf pondweed	x	45
Chara		40
horned pondweed		15

Page 2 of 3

Treatment Area # 2	LAT/LONG or UTM's Will map prior to treatment, see 2008 AVMP update		
Total acres to be controlled ?	Proposed shoreline treatment length (ft) ?	Perpendicular distance from shoreline (ft) ?	
Maximum Depth of Treatment (ft) 20	Expected date(s) of treatment(s) Spring 2008		

Treatment method: [x] Chemical [ ] Physical [ ] Biological Control [ ] Mechanical

Based on treatment method, describe chemical used, method of physical or mechanical control and disposal area, or the species and stocking rate for biological control. Renovate for control of milfoil if it occurs

Plant survey method: [x] Rake [ ] Visual [ ] Other (specify) Summer 2008 T2

Aquatic Plant Name	Check if Target Species	Relative Abundance % of Community
Brittle naiad		56
Chara		10
Sago Pondweed		10
Slender naiad		10
leafy pondweed		10
Eurasian watermilfoil	x	2
horned pondweed		2

INSTRUCTIONS: Whoever treats the lake fills in "Applicant's Signature" unless they are a professional. If they are a professional company who specializes in lake treatment, they should sign on the "Certified Applicant" line.

Applicant Signature	Date
Certified Applicant's Signature	Date

FOR OFFICE ONLY

[ ] Approved [ ] Disapproved	Fisheries Staff Specialist
[ ] Approved [ ] Disapproved	Environmental Staff Specialist

Mail check or money order in the amount of $5.00 to:

DEPARTMENT OF NATURAL RESOURCES
DIVISION OF FISH AND WILDLIFE
COMMERCIAL LICENSE CLERK
402 WEST WASHINGTON STREET ROOM W273
INDIANAPOLIS, IN 46204

AQUATIC CONTROL

Permit Map For Curlyleaf Pondweed